SEQUENCE LISTING

<110> Courtney, Harry

<120> Streptococcal Serum Opacity Factors And Fibronectin-Binding Proteins And Peptides Thereof For The Treatment And Detection of Streptococcal Infection

<130> 13314.1001U

<160> 57

<170> FastSEQ for Windows Version 4.0

<210> 1
<211> 1046
<212> PRT
<213> Streptococcus pyogenes

<400> 1

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Ser Ala Ser Thr Thr Ser Thr Glu Thr Ser Thr Ala Ser Ala Gly Val
        35                  40                  45
Gly Thr Ser Gly Thr Ala Ala Ser Glu Thr Gly Ser Gly Ala Ala Val
    50                  55                  60
Thr Thr Ala Thr Thr Thr Thr Ala Thr Thr Asn Gly Gly Pro Gln Ser
65                  70                  75                  80
Thr Pro Ala Val Ala Glu Ala Thr Pro Gln Pro Gln Ala Gln Ile Ala
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Pro Val Ala Ala Ala Thr Ser Thr Ser Ser Ala Ser Ser Ser Ser Asp
            100                 105                 110
Gly Lys Ala Pro Gln Ala Val Thr Ser Ser Thr Ser Pro Ser Thr Pro
        115                 120                 125
Ala Ala Ala Ser Ser Asn Gly Ser Asn Gln Glu Ala Ser Ala Glu Thr
    130                 135                 140
Glu Pro Gln Thr Met Glu Val Glu Lys Tyr Thr Val Asp Lys Glu Asn
145                 150                 155                 160
Ser Lys Leu Asn Ile Lys Asp Gly Lys Thr Pro Lys Thr Gly Ser Ser
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Val Asn Asn Glu Lys Asp Thr Lys Leu Ile Arg Asn Arg Asp Gly Lys
            180                 185                 190
Leu Arg Asp Ile Val Asp Val Thr Arg Thr Val Lys Thr Asn Glu Asp
        195                 200                 205
Gly Thr Ile Asp Val Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu
    210                 215                 220
Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Ser Glu
225                 230                 235                 240
Asp Asp Phe Asn Asn Ala Lys Asn Lys Ile Lys Lys Leu Val Lys Thr
                245                 250                 255
Leu Thr Ser Lys Ser Ala Ser Asn Ser Asp Asn Asp Glu His Lys Tyr
            260                 265                 270
Asn Ser Arg Asn Ser Val Arg Leu Met Thr Phe Tyr Arg Glu Ile Ser
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Asn Pro Ile Asp Ile Ser Gly Lys Thr Glu Glu Gln Leu Asp Lys Leu
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325 330 335
Lys Glu Lys Lys Phe Gly Lys Arg Arg His Ile Val Leu Phe Ser Gln
340 345 350
Gly Glu Ser Thr Phe Ser Tyr Glu Leu Gln Asn Ser Val Arg Glu Asp
355 360 365
Lys Thr Lys Leu Ser Arg Leu Ser Gly Ala Val Thr Ser Ser Asn Pro
370 375 380
Leu Leu Pro Trp Pro Pro Ile Phe Asn His Thr His Lys Asn Ile Asp
385 390 395 400
Met Leu Asp Asp Val Lys Asn Leu Val Lys Leu Gly Gln Thr Leu Gly
405 410 415
Ile Ala Gly Leu Asp Asn Leu Gln Ser Thr Leu Ser Leu Ile Ser Thr
420 425 430
Gly Ser Ser Leu Ala Gly Ala Phe Leu Gly Gly Gly Ser Leu Thr Glu
435 440 445
Tyr Leu Thr Leu Lys Glu Tyr Lys Ser Gly Asp Leu Lys Glu Asn Gln
450 455 460
Phe Asp Tyr Thr Lys Arg Val Gly Glu Gly Tyr His Phe His Ser Phe
465 470 475 480
Ser Glu Arg Lys Lys Thr Gly Glu Ile Pro Phe Lys Ser Glu Ile Glu
485 490 495
Pro Lys Ile Lys Glu Leu Phe Glu Asn Asn Lys Asn Asn Gln Asp Lys
500 505 510
Ser Trp Thr Glu Trp Ile Phe Asp Lys Leu Ser Leu Thr Glu Arg Ile
515 520 525
Gln Lys Ala Lys Gln Glu Thr Leu Met Lys Leu Leu Glu Tyr Leu Phe
530 535 540
Tyr Lys Arg Glu Tyr His Tyr Tyr Asn His Asn Leu Ser Ala Ile Ala
545 550 555 560
Glu Ala Lys Met Ala Gln Gln Glu Gly Ile Thr Phe Tyr Ser Val Asp
565 570 575
Val Thr Asp Leu Lys Thr Thr Ser Lys Arg Val Lys Arg Gln Val Glu
580 585 590
Ser Thr Glu Asp Lys Lys Lys Glu Lys Asp Arg Glu Asp Ile Glu Lys
595 600 605
Glu Arg Asn Glu Lys Phe Asp Asn Tyr Leu Lys Gln Met Ser Glu Gly
610 615 620
Gly Lys Asp Phe Phe Glu Asp Val Asp Lys Ala Glu Lys Phe Lys Asp
625 630 635 640
Ile Leu Thr Asn Val Thr Val Thr Glu Thr Phe Glu Asp Gly Val Asn
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Val Lys Asp Asn Ser Trp Gln Val Ser Ser Glu Asn Asn Asn Ser Leu
660 665 670
His Ser Asn Tyr Lys Ser Val Thr His Lys Ala Ala Ser Asp Ala Ser
675 680 685
Trp Trp Ser Leu Tyr Ser Asn Lys Glu Ser Leu Thr Trp Thr Ile Ser
690 695 700
Lys Glu Gln Leu Lys Glu Ala Phe Glu Lys Asn Ser Ser Leu Thr Phe
705 710 715 720
Lys Tyr Lys Leu Gln Val Asn Lys Gln Lys Leu Leu Asp Lys Asn Lys
725 730 735
Asn Arg Thr Lys Arg Asp Thr Ser Thr Glu Asn Lys Thr Ser Val Thr
740 745 750

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Lys Asp Ile Ile Ser Asn Thr Val Asn Tyr Lys Ile Asn Asn Gln Glu
        755                 760                 765
Val Lys Gly Asn Lys Leu Asp Asp Val Lys Leu Thr Tyr Thr Lys Glu
    770                 775                 780
Thr Val Pro Val Pro Asp Val Glu Gly Glu Val Val Pro Ile Pro Glu
785                 790                 795                 800
Lys Pro Leu Val Glu Pro Met Thr Pro Leu Tyr Pro Ala Ile Pro Asn
                805                 810                 815
Tyr Pro Thr Pro Asp Ile Pro Thr Pro Gln Leu Pro Lys Asp Glu Asp
            820                 825                 830
Leu Glu Ile Ser Gly Gly His Gly Pro Ser Val Asp Ile Val Glu Asp
        835                 840                 845
Thr Gly Thr Gly Ala Glu Gly Gly Ala Gln Asn Gly Val Val Ser Thr
    850                 855                 860
Gln Glu Asn Arg Asp Pro Ile Val Asp Ile Thr Glu Asp Thr Gln Pro
865                 870                 875                 880
Gly Met Ser Gly Ser Asn Asp Ala Thr Val Val Glu Glu Asp Thr Ala
                885                 890                 895
Pro Lys Arg Pro Asp Val Leu Val Gly Gly Gln Ser Asp Pro Ile Asp
            900                 905                 910
Ile Thr Glu Asp Thr Gln Pro Ser Val Ser Gly Ser Asn Asp Ala Thr
        915                 920                 925
Val Val Glu Glu Asp Thr Val Pro Lys Arg Pro Asp Ser Leu Val Gly
    930                 935                 940
Gly Gln Ser Asp Pro Ile Asp Ile Thr Glu Asp Thr Gln Pro Gly Met
945                 950                 955                 960
Ser Gly Ser Asn Gly Ala Thr Val Ile Glu Glu Asp Thr Arg Pro Lys
                965                 970                 975
Arg Val Phe His Phe Asp Asn Glu Pro Gln Ala Pro Glu Lys Pro Asn
            980                 985                 990
Glu Gln Pro Ser Leu Ser Leu Pro Gln Ala Pro Val Tyr Lys Ala Ala
        995                 1000                1005
His His Leu Pro Ala Ser Gly Asp Lys Arg Glu Ala Ser Phe Thr Ile
    1010                1015                1020
Ala Ala Pro Thr Ile Ile Gly Ala Ala Gly Leu Leu Ser Lys Lys Arg
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Arg Asp Thr Glu Gly Asn
                1045
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<212> DNA
<213> Streptococcus pyogenes

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acgagtactg ctagcgctgg tgtcggtacg agtgggacgg ccgccagcga aactgggagt     180
ggagcagccg taactactgc cactactacc accgctacta ccaatggagg accccagtct     240
actccagcag tagctgaagc gactccacaa cctcaagcac agatagctcc agtagcagca     300
gcaacgtcga catcatcggc ttcttctagt agtgacggga aagctcctca ggcagtaact     360
tcatctacat caccttcaac tccagcagca gccagtagta atggtagcaa tcaagaagct     420
agtgctgaga ctgagccaca gacgatggaa gtggaaaagt atacagttga taaggaaaat     480
tcaaagctaa atattaaaga cggtaagact ccaaaaactg ggagtagtgt taataatgaa     540
aaagacacaa aacttattag aaaccgcgat ggcaaacttc gtgatattgt tgatgttact     600
cggacagtta aaactaacga agatggcact attgatgtta ccgtaacggt taaaccgaag     660
caaattgacg aaggtgccga tgttatggcc cttttagatg tctctaaaaa gatgtcagaa     720
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gatgatttta acaacgctaa gaataagatc aagaaattag tcaaaacctt aacgagtaaa     780
tcagcgagta actcagataa tgatgagcat aaatataatt ctcgaaattc ggttcgtctg     840
atgacctttt accgtgagat tagcaaccca attgatatat caggaaaaac cgaggaacaa     900
cttgataaat tattagacga tcttcgcaaa aaagctaaag ctaattatga ctgggggttt     960
gatttacagg gagctatcca caaggctcga gagattttta ataaggaaaa agaaaaaaaa    1020
tttggtaaac gccggcatat cgtcctattc tctcaaggcg agtcaacctt tagttatgaa    1080
cttcaaaata gtgttagaga agataaaact aagttatccc gattaagtgg agcagttact    1140
tcgtccaacc ctctgctacc ctggccacct atttttaatc atacgcataa aaatatagac    1200
atgcttgacg atgtaaagaa tttggtaaaa ctaggtcaaa ctttaggaat tgcagggcta    1260
gataatttac agagtacatt gagcttaata tcgacaggaa gttctctggc aggagcgttt    1320
ttagggggggg ggagtctgac agaatacctc actctaaagg agtataaatc aggagactta    1380
aaagaaaatc agtttgatta taccaaacgt gttggtgaag gatatcattt ccatagtttt    1440
tctgagagaa aaaaaactgg cgaaataccg tttaagagtg aaatagaacc aaaaataaaa    1500
gaattatttg aaaataacaa gaataatcaa gataaatcat ggactgagtg gatatttgat    1560
aaattatcac tgacagagag aattcaaaaa gctaagcagg aaacacttat gaagctgctt    1620
gaatacctct tttacaaacg tgaataccac tactataatc acaacctctc agcgatagct    1680
gaagctaaaa tggctcaaca agaaggtatc accttctatt ccgttgatgt tactgattta    1740
aaaacaactt ctaaaagagt gaagcgacaa gtagaaagta cagaggataa gaaaaaagaa    1800
aaagataggg aagacattga aaaagaacgt aacgaaaagt ttgataatta cttaaaacaa    1860
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atcttaacta atgtaacggt gaccgagact tttgaagatg gggttaacgt taaggataat    1980
tcatggcaag tttcatcaga gaataataat agcttacata gtaattataa gagtgttaca    2040
cataaagcag catctgatgc aagttggtgg tctttgtata gtaacaaaga aagtcttact    2100
tggaccattt ctaaagagca gctcaaagaa gcctttgaga aaaatagttc tctcactttc    2160
aagtacaagt tacaggtaaa taaacaaaaa ctattagata aaaacaagaa tagaacaaaa    2220
cgtgatacat ctacggaaaa taagacttct gtaacgaaag acattatttc aaatactgtt    2280
aactacaaaa ttaataatca agaagttaag ggtaacaaac ttgatgatgt caagttgact    2340
tatactaaag agaccgttcc tgttccagat gtggaaggag aagttgtacc aataccagaa    2400
aaaccactgg tagagccaat gacgcctcta tatcctgcaa ttcctaatta cccaacacca    2460
gatatcccta cccctcaact tccaaaagat gaagatctgg agattagtgg aggtcatgga    2520
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gtggtttcaa ctcaggagaa tagagatcca atcgttgaca tcaccgaaga tacccaacca    2640
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agccttgttg gcggtcaaag tgatccaatc gacatcaccg aagataccca accaggcatg    2880
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caagcgccag tctataaggc agctcatcac ttgcctgcat ctggagacaa acgtgaagca    3060
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<210> 3
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<212> PRT
<213> Streptococcus pyogenes

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            20                  25                  30
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Ser Val Gly Thr Ser Thr Gly Gly Ala Ala Gly Gly Glu Ala Ala Val
        35                  40                  45
Ala Ser Ser Gly Gly Ser Gln Ser Ser Glu Ser Ala Gln Ala Ser Thr
    50                  55                  60
Gln Pro Gln Ala Gln Thr Ala Val Ala Ala Ser Ala Ser Thr Thr Ala
65                  70                  75                  80
Ser Pro Ser Ser Ser Glu Glu Lys Thr Pro Lys Thr Val Thr Ser Ser
                85                  90                  95
Thr Ser Ser Thr Pro Ala Ala Ser Ser Ser Ser Asn Gly Asn Gln Val
            100                 105                 110
Thr Gly Thr Glu Val Glu Pro Gln Met Met Asp Val Glu Gln Tyr Lys
        115                 120                 125
Val Asn Lys Glu Lys Thr Glu Leu Thr Val Lys Asp Asp Lys Gln Gln
    130                 135                 140
Leu Lys Ile Arg Lys Asp Val Glu Leu Lys Asn Lys Asp Pro Phe Asp
145                 150                 155                 160
Val Lys Arg Glu Val Lys Asp Asn Gly Asp Gly Thr Leu Asp Val Thr
                165                 170                 175
Leu Lys Val Met Leu Lys Gln Ile Asp Glu Gly Ala Asp Val Met Ala
            180                 185                 190
Leu Leu Asp Val Ser Gln Lys Met Thr Gln Glu Asn Phe Asn Lys Ala
        195                 200                 205
Lys Glu Gln Ile Lys Arg Leu Val Thr Thr Leu Thr Gly Lys Ser Ser
    210                 215                 220
Asp Gly Lys Glu Asn His Asn Arg Arg Asn Ser Val Arg Leu Met Thr
225                 230                 235                 240
Phe Tyr Arg Lys Ile Ser Glu Pro Ile Asp Leu Ser Gly Lys Thr Ser
                245                 250                 255
Asp Glu Val Glu Lys Glu Leu Asn Lys Ile Trp Asp Lys Val Lys Lys
            260                 265                 270
Glu Asp Trp Asp Trp Gly Val Asp Leu Gln Gly Ala Ile His Lys Ala
        275                 280                 285
Arg Glu Ile Phe Arg Ser Ser Tyr Glu Lys Lys Ser Gly Lys Arg Gln
    290                 295                 300
His Ile Val Leu Phe Ser Gln Gly Glu Pro Thr Phe Ser Tyr Asp Ile
305                 310                 315                 320
Lys Asn Lys Asn Asp Asn Lys Leu Thr Lys Ala Arg Ile Glu Glu Glu
                325                 330                 335
Val Thr Ser Ser Asn Pro Leu Leu Ser Trp Pro Pro Ile Phe Asn His
            340                 345                 350
Thr Asn Arg Lys Ala Asp Met Leu Asn Asp Ile Glu Tyr Leu Ile Lys
        355                 360                 365
Leu Gly Glu Arg Leu Gly Ile Thr Gly Leu Asp Ser Leu Lys Asn Thr
    370                 375                 380
Leu Lys Leu Ala Ser Thr Gly Ser Ser Ile Ala Gly Ser Leu Leu Gly
385                 390                 395                 400
Ser Gly Ser Leu Ser Glu Tyr Leu Thr Leu Lys Glu Tyr Glu Ser Arg
                405                 410                 415
Thr Leu Lys Glu Ser Asn Phe Asp Tyr Thr Lys Arg Val Gly Glu Gly
            420                 425                 430
Tyr Tyr Tyr His Ser Phe Ser Glu Arg Ile Gln Asn Glu Leu Pro Leu
        435                 440                 445
Lys Ser Ile Ile Glu Pro Gln Leu Lys Gly Leu Phe Lys Thr Glu Asp
    450                 455                 460
Ser Ser Trp Phe Gly Arg Phe Leu Asn Lys Phe Ser Leu Ala Lys Gly
465                 470                 475                 480
Tyr Leu Arg Ile Lys Glu Thr Ala Leu Leu Lys Val Leu Glu Tyr Leu
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Phe Tyr Lys Arg Glu Tyr Ile Tyr Tyr Asn His Asn Leu Ser Ala Ile
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Asp Val Thr Ser Pro Asn Gln Ser Ala Asn Lys Arg Thr Arg Arg Ser
    530                 535                 540
Ala Asp Thr Pro Glu Glu Lys Arg Asn Lys Lys Phe Asp Asn Tyr Leu
545                 550                 555                 560
Lys Glu Cys Pro Glu Gly Arg Lys Phe Phe Arg Arg Val Arg Met Ser
                565                 570                 575
Gln Ile Lys Asp Lys Phe Lys Asp Thr Leu Thr Glu Leu Thr Ile Lys
            580                 585                 590
Asp Glu Phe Xaa Glu Lys Val Thr Val His Lys Asp Lys Glu Tyr Tyr
        595                 600                 605
Lys Thr Ser Leu Ile Asp Asp Arg Pro Lys Val Thr His Gln Ala Pro
    610                 615                 620
Tyr Ser Ser Trp Leu Asn Ser Thr Lys Glu Ser Leu Thr Trp Thr Ile
625                 630                 635                 640
Ser Lys Asp Gln Leu Lys Lys Ala Phe Glu Ser Gly Gln Pro Leu Thr
                645                 650                 655
Leu Thr Tyr Lys Leu Lys Val Glu Lys Glu Lys Phe Lys Glu Ala Leu
            660                 665                 670
Lys Lys Gln Gln Glu Arg Lys Lys Arg Ala Ala Ser Pro Glu Ser Glu
        675                 680                 685
Asn Thr Val Thr Asp Thr Ile Ile Ser Asn Lys Ile Ser Tyr Lys Ile
    690                 695                 700
Asn Asn Gly Thr Asp Ile Asn Ser Asn Asn Asn Lys Leu Glu Asp Val
705                 710                 715                 720
Lys Met Ser Tyr Ser Lys Phe Lys Met Pro Ile Pro Glu Leu Asp Ile
                725                 730                 735
Glu Val Val Pro Ile Pro Glu Lys Pro Leu Val Glu Pro Met Thr Pro
            740                 745                 750
Leu Tyr Pro Ala Ile Pro Asn Tyr Pro Thr Pro Asp Ile Pro Thr Leu
        755                 760                 765
Gln Leu Pro Lys Asp Glu Asp Leu Glu Ile Ser Gly Gly His Gly Pro
    770                 775                 780
Ile Val Asp Ile Val Glu Asp Thr Gly Thr Gly Val Glu Gly Gly Ala
785                 790                 795                 800
Gln Thr Gly Val Val Ser Thr Gln Glu Asn Lys Asp Pro Ile Val Asp
                805                 810                 815
Ile Thr Glu Asp Thr Gln Pro Gly Met Ser Gly Ser Asn Asp Ala Thr
            820                 825                 830
Val Val Glu Glu Asp Thr Thr Pro Lys Arg Pro Asp Val Leu Val Gly
        835                 840                 845
Gly Gln Ser Asp Pro Ile Asp Ile Thr Glu Asp Thr Gln Pro Ser Val
    850                 855                 860
Ser Gly Ser Asn Asp Ala Thr Val Ile Glu Glu Asp Thr Lys Pro Lys
865                 870                 875                 880
Arg Phe Phe His Phe Asp Asn Glu Pro Gln Ala Pro Glu Lys Pro Lys
                885                 890                 895
Glu Gln Pro Ser Leu Gln Asp Ser Asn Ser Leu Pro Gln Ala Pro Ala
            900                 905                 910
Tyr Lys Ala Ala His His Leu Pro Ala Ser Gly Asp Lys Arg Glu Val
        915                 920                 925
Tyr Phe Thr Ile Ala Ala Leu Thr Ile Ile Gly Ala Ala Gly Leu Leu
    930                 935                 940
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<212> DNA
<213> Streptococcus pyogenes

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<223> n = A,T,C or G

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cttttnnntc cctggcaatt tcctaattna ncccaaacac caggatatcc ctaccnttca     180
acttcccaaa aagatgaaga ncctggagat tagtggaggt catggacccg attgtcgata     240
tcgtcgaaga tactggtaca ggtgttgagg gcggcgctca aaacggcgtg gtttcaactc     300
aggaaaataa agatccaatc gttgacatca cggaagatac ccaaccaggt atgtcaggct     360
ctaatgacgc aacagttgtc gaggaagaca caacacctaa acgtccagat gttcttgttg     420
gtggtcaaag tgatccaatc gacatcactg aagacaccca accaagtgta tcaggctcta     480
atgacgctac tgttatcgaa gaagatacga aaccaaaacg cttcttccac tttgataacg     540
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cacaagctcc agcctataag gcagctcatc acttgcctgc atctggagac aaacgtgaag     660
tatactttac aattgctgct ctaacaatta ttggagctgc aggtttgctc agcaaaaaac     720
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<212> PRT
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            20                  25                  30
Ser Ala Ser Ser Ser Thr Glu Ser Ser Thr Thr Thr Ala Asn Thr Gly
        35                  40                  45
Thr Gly Thr Ala Ser Gly Met Thr Ala Thr Thr Pro Ser Ala Thr Thr
    50                  55                  60
Asp Thr Gly Glu Ala Ala Gly Ser Gly Ala Arg Ser Glu Ala Asn Gly
65                  70                  75                  80
Ala Ser Ser Val Val Ser Ser Glu Glu Ser Gln Ser Ser Gly Thr Thr
                85                  90                  95
Pro Ala Ser Pro Gln Ala Gln Thr Ala Pro Ala Ala Thr Ser Thr Ser
            100                 105                 110
Ser Val Ser Ser Ser Asn Glu Lys Thr Pro Lys Thr Ala Thr Thr Thr
        115                 120                 125
Thr Ser Ser Thr Pro Val Ala Ser Thr Ser Asn Asn Ser Asn Lys Val
    130                 135                 140
Thr Ser Thr Glu Ala Glu Thr Gln Thr Val Asp Val Glu Arg Tyr Thr
145                 150                 155                 160
Val Asp Lys Glu Asn Ser Lys Leu Asn Ile Lys Asp Gly Lys Thr Pro
                165                 170                 175
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Lys Thr Arg Ser Ser Val Asn Lys Asp Thr Lys Leu Ile Arg Asn Arg
            180                 185                 190
Asp Asp Lys Gln Arg Asp Ile Val Asp Val Thr Arg Thr Val Glu Thr
        195                 200                 205
Asn Glu Asp Gly Leu Leu Met Phe Thr Gly Asn Gly Leu Lys Pro Lys
    210                 215                 220
Gln Ile Asp Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Gln
225                 230                 235                 240
Lys Met Thr Lys Glu Asn Phe Asp Lys Ala Lys Glu Gln Ile Lys Lys
                245                 250                 255
Met Val Thr Thr Leu Thr Gly Glu Pro Thr Asp Gly Lys Glu Asn His
            260                 265                 270
Asn Arg Arg Asn Ser Val Arg Leu Met Thr Phe Tyr Arg Lys Val Asn
        275                 280                 285
Glu Pro Ile Glu Leu Thr Ala Glu Asn Val Asp Lys Thr Leu Asp Glu
    290                 295                 300
Val Trp Lys Lys Ala Lys Glu Asp Trp Asp Trp Gly Val Asp Leu Gln
305                 310                 315                 320
Gly Ala Ile His Lys Ala Arg Glu Ile Phe Asn Lys Glu Lys Glu Lys
                325                 330                 335
Lys Ser Gly Lys Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser
            340                 345                 350
Thr Phe Ser Tyr Asp Ile Lys Asn Lys Met Ile Leu Gln Lys Leu Pro
        355                 360                 365
Ile Thr Glu Lys Val Thr Thr Ser Ser Pro Leu Phe Pro Trp Leu Pro
    370                 375                 380
Ile Phe Asn His Thr Asn Arg Lys Ala Glu Ile Ile Gly Asp Leu Glu
385                 390                 395                 400
Lys Val Leu Asp Met Ala Glu Lys Val Gly Ile Ser Leu Pro Ser Ser
                405                 410                 415
Leu Lys Ser Ala Val Lys Val Leu Gly Leu Thr Asn Ser Ala Ile Gly
            420                 425                 430
Ser Ile Leu Gly Lys Gly Leu Thr Glu Tyr Leu Gly Leu Thr Glu Tyr
        435                 440                 445
Ser Ser Asp Asn Leu Asp Gly Gly Gly Phe Asp Tyr Ser Lys Arg Val
    450                 455                 460
Gly Glu Gly Tyr Tyr Tyr His Ser Leu Ser Asp Arg Lys Tyr Glu Asn
465                 470                 475                 480
Thr Met Pro Leu Glu Glu Ala Ile Arg Thr Ala Leu Ala Ser Asn Phe
                485                 490                 495
Pro Lys Leu Thr Asp Asn Trp Phe Phe Asp Ile Leu Asn Ser Phe Val
            500                 505                 510
Asn Lys Asp Thr Val Glu Lys Ala Lys Leu Asp Val Ile Met Lys Val
        515                 520                 525
Leu Asn Ser Ile Phe Tyr Lys Lys Glu Tyr Arg Tyr Tyr Asn His Asn
    530                 535                 540
Leu Ser Ala Ile Ala Glu Ala Lys Met Ala Gln Gln Glu Gly Ile Thr
545                 550                 555                 560
Phe Tyr Ser Val Asp Val Thr Asp Leu Asn Ser Ala Ser Lys Arg Val
                565                 570                 575
Arg Arg Gln Ala Ala Val Arg Lys Gly Thr Lys Glu Glu Asn Lys Lys
            580                 585                 590
Asn Glu Glu Glu Arg Asn Thr Lys Phe Asp Thr Tyr Leu Lys Lys Met
        595                 600                 605
Ser Glu Gly Asn Asn Phe Leu Ser Asn Val Glu Glu Arg Asp Phe Phe
    610                 615                 620
Lys Asp Thr Leu Thr Glu Leu Thr Ile Lys Asp Glu Phe Thr Asp Lys
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625 630 635 640
Val Thr Val Glu Lys Asp Ser Trp Ser Lys Ser Ile Thr Asp Gly Leu
645 650 655
Lys Asn Ser Asn Asn Asn Asn Val Lys His Gln Gln Ala Asn Thr Ser
660 665 670
Thr Trp Ser Phe Phe Ser Ser Ser Lys Glu Ser Leu Thr Trp Ile Ile
675 680 685
Ser Lys Glu Ala Leu Lys Glu Thr Phe Glu Lys Asn Gly Ser Leu Thr

690 695 700
Phe Lys Tyr Lys Leu Arg Val Asn Lys Asp Lys Leu Leu Asp Leu Asp
705 710 715 720
Lys Lys Glu Thr Lys Arg Asp Thr Ser Thr Glu Asn Lys Thr Ser Val
725 730 735
Thr Ala Asn Ile Ile Ser Asn Thr Val Asn Tyr Lys Ile Asn Asn Gln
740 745 750
Glu Val Lys Gly Asn Lys Leu Asp Ala Val Asn Leu Thr Tyr Thr Lys
755 760 765
Glu Thr Val Pro Val Pro Asp Val Glu Gly Glu Val Val Pro Ile Pro
770 775 780
Glu Lys Pro Leu Val Glu Pro Met Thr Pro Leu Tyr Pro Ala Ile Pro
785 790 795 800
Asn Tyr Pro Thr Pro Gln Leu Pro Lys Asp Glu Asp Leu Glu Ile Ser
805 810 815
Gly Gly His Gly Pro Ile Val Asp Ile Val Glu Asp Thr Gly Ala Gly
820 825 830
Val Glu Gly Gly Ala Gln Asn Gly Val Val Ser Thr Gln Glu Asn Lys
835 840 845
Asp Pro Ile Val Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser Gly
850 855 860
Ser Asn Asp Ala Thr Val Val Glu Glu Asp Thr Ala Pro Lys Arg Pro
865 870 875 880
Asp Val Leu Val Gly Gly Gln Ser Asp Pro Ile Asp Ile Thr Glu Asp
885 890 895
Thr Gln Pro Gly Met Ser Gly Ser Asn Asp Ala Thr Val Ile Glu Glu
900 905 910
Asp Thr Ala Pro Lys Arg Pro Asp Val Leu Val Gly Gly Gln Cys Asp
915 920 925
Pro Ile Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser Gly Ser Asn
930 935 940
Asp Ala Thr Val Ile Glu Asp Asp Thr Lys Pro Lys Arg Phe Phe His
945 950 955 960
Phe Asp Asn Glu Pro Gln Ala Pro Glu Lys Pro Lys Glu Gln Pro Ser
965 970 975
Leu Ser Leu Pro Gln Ala Pro Val Tyr Lys Ala Ala His His Leu Pro
980 985 990
Ala Ser Gly Asp Lys Arg Glu Ala Ser Phe Thr Ile Val Ala Leu Thr
995 1000 1005
Ile Ile Gly Ala Ala Gly Leu Leu Ser Lys Lys Arg Arg Asp Thr Glu
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Glu Asn
1025

<210> 6
<211> 3081
<212> DNA

<213> Streptococcus pyogenes

<400> 6

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gatgttactc ggacagttga aactaacgaa gatggcctat tgatgtttac cggtaacggg 660
ttaaaaccga agcaaattga cgaaggtgcc gatgttatgg cccttctaga tgtctctcaa 720
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<212> PRT
<213> Streptococcus pyogenes

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35 40 45
Glu Ala Thr Pro Gln Pro Gln Ala Gln Ile Ala Pro Val Ala Ala Ala
50 55 60
Thr Ser Thr Ser Ser Ala Ser Ser Ser Ser Asp Gly Lys Ala Pro Gln
65 70 75 80
Ala Val Thr Ser Ser Thr Ser Pro Ser Thr Pro Ala Ala Ala Ser Ser
85 90 95
Asn Gly Ser Asn Gln Glu Ala Ser Ala Glu Thr Glu Pro Gln Thr Met
100 105 110
Glu Val Glu Lys Tyr Thr Val Asp Lys Glu Asn Ser Lys Leu Asn Ile
115 120 125
Lys Asp Gly Lys Thr Pro Lys Thr Gly Ser Ser Val Asn Asn Glu Lys
130 135 140
Asp Thr Lys Leu Ile Arg Asn Arg Asp Gly Lys Leu Arg Asp Ile Val
145 150 155 160
Asp Val Thr Arg Thr Val Lys Thr Asn Glu Asp Gly Thr Ile Asp Val
165 170 175
Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met
180 185 190
Ala Leu Leu Asp Val Ser Lys Lys Met Ser Glu Asp Asp Phe Asn Asn
195 200 205
Ala Lys Asn Lys Ile Lys Lys Leu Val Lys Thr Leu Thr Ser Lys Ser
210 215 220
Ala Ser Asn Ser Asp Asn Asp Glu His Lys Tyr Asn Ser Arg Asn Ser
225 230 235 240
Val Arg Leu Met Thr Phe Tyr Arg Glu Ile Ser Asn Pro Ile Asp Ile
245 250 255
Ser Gly Lys Thr Glu Glu Gln Leu Asp Lys Leu Leu Asp Asp Leu Arg
260 265 270
Lys Lys Ala Lys Ala Asn Tyr Asp Trp Gly Val Asp Leu Gln Gly Ala
275 280 285
Ile His Lys Ala Arg Glu Ile Phe Asn Lys Glu Lys Glu Lys Lys Phe
290 295 300
Gly Lys Arg Arg His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe
305 310 315 320
Ser Tyr Glu Leu Gln Asn Ser Val Arg Glu Asp Lys Thr Lys Leu Ser
325 330 335
Arg Leu Ser Gly Ala Val Thr Ser Ser Asn Pro Leu Leu Pro Trp Pro
340 345 350
Pro Ile Phe Asn His Thr His Lys Asn Ile Asp Met Leu Asp Asp Val
355 360 365
Lys Asn Leu Val Lys Leu Gly Gln Thr Leu Gly Ile Ala Gly Leu Asp
370 375 380

Asn Leu Gln Ser Thr Leu Ser Leu Ile Ser Thr Gly Ser Ser Leu Ala
385 390 395 400

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Gly Ala Phe Leu Gly Gly Gly Ser Leu Thr Glu Tyr Leu Thr Leu Lys
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Glu Tyr Lys Ser Gly Asp Leu Lys Glu Asn Gln Phe Asp Tyr Thr Lys
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Arg Val Gly Glu Gly Tyr His Phe His Ser Phe Ser Glu Arg Lys Lys
        435                 440                 445
Thr Gly Glu Ile Pro Phe Lys Ser Glu Ile Glu Pro Lys Ile Lys Glu
    450                 455                 460
Leu Phe Glu Asn Asn Lys Asn Asn Gln Asp Lys Ser Trp Thr Glu Trp
465                 470                 475                 480
Ile Phe Asp Lys Leu Ser Leu Thr Glu Arg Ile Gln Lys Ala Lys Gln
                485                 490                 495
Glu Thr Leu Met Lys Leu Leu Glu Tyr Leu Phe Tyr Lys Arg Glu Tyr
            500                 505                 510
His Tyr Tyr Asn His Asn Leu Ser Ala Ile Ala Glu Ala Lys Met Ala
        515                 520                 525
Gln Gln Glu Gly Ile Thr Phe Tyr Ser Val Asp Val Thr Asp Leu Lys
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Thr Thr Ser Lys Arg Val Lys Arg Gln Val Glu Ser Thr Glu Asp Lys
545                 550                 555                 560
Lys Lys Glu Lys Asp Arg Glu Asp Ile Glu Lys Glu Arg Asn Glu Lys
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Phe Asp Asn Tyr Leu Lys Gln Met Ser Glu Gly Gly Lys Asp Phe Phe
            580                 585                 590
Glu Asp Val Asp Lys Ala Glu Lys Phe Lys Asp Ile Leu Thr Asn Val
        595                 600                 605
Thr Val Thr Glu Thr Phe Glu Asp Gly Val Asn Val Lys Asp Asn Ser
    610                 615                 620
Trp Gln Val Ser Ser Glu Asn Asn Asn Ser Leu His Ser Asn Tyr Lys
625                 630                 635                 640
Ser Val Thr His Lys Ala Ala Ser Asp Ala Ser Trp Trp Ser Leu Tyr
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Ser Asn Lys Glu Ser Leu Thr Trp Thr Ile Ser Lys Glu Gln Leu Lys
            660                 665                 670
Glu Ala Phe Glu Lys Asn Ser Ser Leu Thr Phe Lys Tyr Lys Leu Gln
        675                 680                 685
Val Asn Lys Gln Lys Leu Leu Asp Lys Asn Lys Asn Arg Thr Lys Arg
    690                 695                 700
Asp Thr Ser Thr Glu Asn Lys Thr Ser Val Thr Lys Asp Ile Ile Ser
705                 710                 715                 720
Asn Thr Val Asn Tyr Lys Ile Asn Asn Gln Glu Val Lys Gly Asn Lys
                725                 730                 735
Leu Asp Asp Val Lys Leu Thr Tyr Thr Lys Glu Thr Val Pro Val Pro
            740                 745                 750

Asp Val Glu Gly Glu Val Val Pro Ile Pro Glu Lys Pro Leu Val Glu
        755                 760                 765
Pro Met Thr Pro Leu Tyr Pro Ala Ile Pro Asn Tyr Pro Thr Pro Asp
    770                 775                 780
Ile Pro Thr Pro Gln Leu Pro Lys Asp Glu Asp Leu Glu Ile Ser Gly
785                 790                 795                 800
Gly His Gly Pro Ser Val Asp Ile Val Glu Asp Thr Gly Thr Gly Ala
                805                 810                 815
Glu Gly Gly Ala Gln Asn Gly Val Val Ser Thr Gln Glu Asn Arg Asp
            820                 825                 830
Pro Ile Val Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser Gly Ser
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        835                 840                 845
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Val Leu Val Gly Gly Gln Ser Asp Pro Ile Asp Ile Thr Glu Asp Thr
865                 870                 875                 880
Gln Pro Ser Val Ser Gly Ser Asn Asp Ala Thr Val Val Glu Glu Asp
                885                 890                 895
Thr Val Pro Lys Arg Pro Asp Ser Leu Val Gly Gly Gln Ser Glu Pro
            900                 905                 910
Ile Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser Gly Ser Asn Gly
        915                 920                 925
Ala Thr Val Ile Glu Glu Asp Thr Arg Pro Lys Arg Val Phe His Phe
    930                 935                 940
Asp Asn Glu Pro Gln Ala Pro Glu Lys Pro Asn Glu Gln Pro Ser Leu
945                 950                 955                 960
Ser Leu Pro Gln Ala Pro Val Tyr Lys Ala Ala His His Leu Pro Ala
                965                 970                 975
Ser Gly Asp Lys Arg Glu Ala Ser Phe Thr Ile Ala Ala Pro Thr Ile
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Ile Gly Ala Ala Gly Leu Leu Ser Lys Lys Arg Arg Asp Thr Glu Gly
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<210> 8
<211> 3024
<212> DNA
<213> Streptococcus pyogenes

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tctactccag cagtagctga agcgactcca caacctcaag cacagatagc tccagtagca     180
gcagcaacgt cgacatcatc ggcttcttct agtagtgacg ggaaagctcc tcaggcagta     240
acttcatcta catcaccttc aactccagca gcagccagta gtaatggtag caatcaagaa     300
gctagtgctg agactgagcc acagacgatg gaagtggaaa agtatacagt tgataaggaa     360
aattcaaagc taaatattaa agacggtaag actccaaaaa ctgggagtag tgttaataat     420

gaaaaagaca caaaacttat tagaaaccgc gatggcaaac ttcgtgatat tgttgatgtt     480
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aagcaaattg acgaaggtgc cgatgttatg gccctttag atgtctctaa aaagatgtca      600
gaagatgatt ttaacaacgc taagaataag atcaagaaat tagtcaaaac cttaacgagt     660
aaatcagcga gtaactcaga taatgatgag cataaatata attctcgaaa ttcggttcgt     720
ctgatgacct tttaccgtga gattagcaac ccaattgata tatcaggaaa aaccgaggaa     780
caacttgata aattattaga cgatcttcgc aaaaaagcta aagctaatta tgactggggg     840
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gaacttcaaa atagtgttag agaagataaa actaagttat cccgattaag tggagcagtt    1020
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aaagaattat ttgaaaataa caagaataat caagataaat catggactga gtggatattt    1440
gataaattat cactgacaga gagaattcaa aaagctaagc aggaaacact tatgaagctg    1500
cttgaatacc tcttttacaa acgtgaatac cactactata atcacaacct ctcagcgata    1560
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gctgaagcta aaatggctca acaagaaggt atcaccttct attccgttga tgttactgat    1620
ttaaaaacaa cttctaaaag agtgaagcga caagtagaaa gtacagagga taagaaaaaa    1680
gaaaaagata gggaagacat tgaaaaagaa cgtaacgaaa agtttgataa ttacttaaaa    1740
caaatgtctg aaggcggtaa ggatttttt gaagatgttg ataaggcaga aaaatttaaa    1800
gatatcttaa ctaatgtaac ggtgaccgag acttttgaag atggggttaa cgttaaggat    1860
aattcatggc aagtttcatc agagaataat aatagcttac atagtaatta taagagtgtt    1920
acacataaag cagcatctga tgcaagttgg tggtctttgt atagtaacaa agaaagtctt    1980
acttggacca tttctaaaga gcagctcaaa gaagcctttg agaaaaatag ttctctcact    2040
ttcaagtaca agttacaggt aaataaacaa aaactattag ataaaaacaa gaatagaaca    2100
aaacgtgata catctacgga aaataagact tctgtaacga aagacattat ttcaaatact    2160
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<210> 9
<211> 806
<212> PRT
<213> Streptococcus pyogenes

<400> 9

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        35                  40                  45
Glu Ala Thr Pro Gln Pro Gln Ala Gln Ile Ala Pro Val Ala Ala Ala
    50                  55                  60
Thr Ser Thr Ser Ser Ala Ser Ser Ser Ser Asp Gly Lys Ala Pro Gln
65                  70                  75                  80
Ala Val Thr Ser Ser Thr Ser Pro Ser Thr Pro Ala Ala Ala Ser Ser
                85                  90                  95
Asn Gly Ser Asn Gln Glu Ala Ser Ala Glu Thr Glu Pro Gln Thr Met
            100                 105                 110
Glu Val Glu Lys Tyr Thr Val Asp Lys Glu Asn Ser Lys Leu Asn Ile
        115                 120                 125
Lys Asp Gly Lys Thr Pro Lys Thr Gly Ser Ser Val Asn Asn Glu Lys
    130                 135                 140
Asp Thr Lys Leu Ile Arg Asn Arg Asp Gly Lys Leu Arg Asp Ile Val
145                 150                 155                 160
Asp Val Thr Arg Thr Val Lys Thr Asn Glu Asp Gly Thr Ile Asp Val
                165                 170                 175
Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met
            180                 185                 190
Ala Leu Leu Asp Val Ser Lys Lys Met Ser Glu Asp Asp Phe Asn Asn
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        195                 200                 205
Ala Lys Asn Lys Ile Lys Lys Leu Val Lys Thr Leu Thr Ser Lys Ser
    210                 215                 220
Ala Ser Asn Ser Asp Asn Asp Glu His Lys Tyr Asn Ser Arg Asn Ser
225                 230                 235                 240
Val Arg Leu Met Thr Phe Tyr Arg Glu Ile Ser Asn Pro Ile Asp Ile
                245                 250                 255
Ser Gly Lys Thr Glu Glu Gln Leu Asp Lys Leu Leu Asp Asp Leu Arg
            260                 265                 270
Lys Lys Ala Lys Ala Asn Tyr Asp Trp Gly Val Asp Leu Gln Gly Ala
        275                 280                 285
Ile His Lys Ala Arg Glu Ile Phe Asn Lys Glu Lys Glu Lys Lys Phe
    290                 295                 300
Gly Lys Arg Arg His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe
305                 310                 315                 320
Ser Tyr Glu Leu Gln Asn Ser Val Arg Glu Asp Lys Thr Lys Leu Ser
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Arg Leu Ser Gly Ala Val Thr Ser Ser Asn Pro Leu Leu Pro Trp Pro
            340                 345                 350
Pro Ile Phe Asn His Thr His Lys Asn Ile Asp Met Leu Asp Asp Val
        355                 360                 365
Lys Asn Leu Val Lys Leu Gly Gln Thr Leu Gly Ile Ala Gly Leu Asp
    370                 375                 380
Asn Leu Gln Ser Thr Leu Ser Leu Ile Ser Thr Gly Ser Ser Leu Ala
385                 390                 395                 400
Gly Ala Phe Leu Gly Gly Gly Ser Leu Thr Glu Tyr Leu Thr Leu Lys
                405                 410                 415
Glu Tyr Lys Ser Gly Asp Leu Lys Glu Asn Gln Phe Asp Tyr Thr Lys
            420                 425                 430
Arg Val Gly Glu Gly Tyr His Phe His Ser Phe Ser Glu Arg Lys Lys
        435                 440                 445
Thr Gly Glu Ile Pro Phe Lys Ser Glu Ile Glu Pro Lys Ile Lys Glu
    450                 455                 460
Leu Phe Glu Asn Asn Lys Asn Asn Gln Asp Lys Ser Trp Thr Glu Trp
465                 470                 475                 480
Ile Phe Asp Lys Leu Ser Leu Thr Glu Arg Ile Gln Lys Ala Lys Gln
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Glu Thr Leu Met Lys Leu Leu Glu Tyr Leu Phe Tyr Lys Arg Glu Tyr
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His Tyr Tyr Asn His Asn Leu Ser Ala Ile Ala Glu Ala Lys Met Ala
        515                 520                 525
Gln Gln Glu Gly Ile Thr Phe Tyr Ser Val Asp Val Thr Asp Leu Lys
    530                 535                 540
Thr Thr Ser Lys Arg Val Lys Arg Gln Val Glu Ser Thr Glu Asp Lys
545                 550                 555                 560
Lys Lys Glu Lys Asp Arg Glu Asp Ile Glu Lys Glu Arg Asn Glu Lys
                565                 570                 575
Phe Asp Asn Tyr Leu Lys Gln Met Ser Glu Gly Gly Lys Asp Phe Phe
            580                 585                 590
Glu Asp Val Asp Lys Ala Glu Lys Phe Lys Asp Ile Leu Thr Asn Val
        595                 600                 605
Thr Val Thr Glu Thr Phe Glu Asp Gly Val Asn Val Lys Asp Asn Ser
    610                 615                 620
Trp Gln Val Ser Ser Glu Asn Asn Asn Ser Leu His Ser Asn Tyr Lys
625                 630                 635                 640
Ser Val Thr His Lys Ala Ala Ser Asp Ala Ser Trp Trp Ser Leu Tyr
                645                 650                 655
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Ser Asn Lys Glu Ser Leu Thr Trp Thr Ile Ser Lys Glu Gln Leu Lys
            660                 665                 670
Glu Ala Phe Glu Lys Asn Ser Ser Leu Thr Phe Lys Tyr Lys Leu Gln
        675                 680                 685
Val Asn Lys Gln Lys Leu Leu Asp Lys Asn Lys Asn Arg Thr Lys Arg
    690                 695                 700
Asp Thr Ser Thr Glu Asn Lys Thr Ser Val Thr Lys Asp Ile Ile Ser
705                 710                 715                 720
Asn Thr Val Asn Tyr Lys Ile Asn Asn Gln Glu Val Lys Gly Asn Lys
                725                 730                 735
Leu Asp Asp Val Lys Leu Thr Tyr Thr Lys Glu Thr Val Pro Val Pro
            740                 745                 750
Asp Val Glu Gly Glu Val Val Pro Ile Pro Glu Lys Pro Leu Val Glu
        755                 760                 765
Pro Met Thr Pro Leu Tyr Pro Ala Ile Pro Asn Tyr Pro Thr Pro Asp
    770                 775                 780
Ile Pro Thr Pro Gln Leu Pro Lys Asp Glu Asp Leu Glu Ile Ser Gly
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Gly His Gly Pro Ser Val
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<210> 10
<211> 2418
<212> DNA
<213> Streptococcus pyogenes

<400> 10

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ccccagtcta ctccagcagt agctgaagcg actccacaac ctcaagcaca gatagctcca     180
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gcagtaactt catctacatc accttcaact ccagcagcag ccagtagtaa tggtagcaat     300
caagaagcta gtgctgagac tgagccacag acgatggaag tggaaaagta tacagttgat     360
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gaaaaaaaat ttggtaaacg ccggcatatc gtcctattct ctcaaggcga gtcaaccttt     960
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aatatagaca tgcttgacga tgtaaagaat ttggtaaaac taggtcaaac tttaggaatt    1140
gcagggctag ataatttaca gagtacattg agcttaatat cgacaggaag ttctctggca    1200
ggagcgtttt taggggggggg gagtctgaca gaatacctca ctctaaagga gtataaatca    1260
ggagacttaa aagaaaatca gtttgattat accaaacgtg ttggtgaagg atatcatttc    1320
catagttttt ctgagagaaa aaaaactggc gaaataccgt ttaagagtga aatagaacca    1380
aaaataaaag aattatttga aaataacaag aataatcaag ataaatcatg gactgagtgg    1440
atatttgata aattatcact gacagagaga attcaaaaag ctaagcagga aacacttatg    1500
aagctgcttg aatacctctt ttacaaacgt gaataccact actataatca caacctctca    1560
gcgatagctg aagctaaaat ggctcaacaa gaaggtatca ccttctattc cgttgatgtt    1620
actgatttaa aaacaacttc taaaagagtg aagcgacaag tagaaagtac agaggataag    1680
aaaaaagaaa aagataggga agacattgaa aaagaacgta acgaaaagtt tgataattac    1740
ttaaaacaaa tgtctgaagg cggtaaggat ttttttgaag atgttgataa ggcagaaaaa    1800
```

```
tttaaagata tcttaactaa tgtaacggtg accgagactt ttgaagatgg ggttaacgtt    1860
aaggataatt catggcaagt ttcatcagag aataataata gcttacatag taattataag    1920
agtgttacac ataaagcagc atctgatgca agttggtggt ctttgtatag taacaaagaa    1980
agtcttactt ggaccatttc taaagagcag ctcaaagaag cctttgagaa aaatagttct    2040
ctcactttca agtacaagtt acaggtaaat aaacaaaaac tattagataa aaacaagaat    2100
agaacaaaac gtgatacatc tacggaaaat aagacttctg taacgaaaga cattatttca    2160
aatactgtta actacaaaat taataatcaa gaagttaagg gtaacaaact tgatgatgtc    2220
aagttgactt atactaaaga gaccgttcct gttccagatg tggaaggaga agttgtacca    2280
ataccagaaa aaccactggt agagccaatg acgcctctat atcctgcaat tcctaattac    2340
ccaacaccag atatccctac ccctcaactt ccaaaagatg aagatctgga gattagtgga    2400
ggtcatggac cgagtgtc                                                  2418

<210> 11
<211> 553
<212> PRT
<213> Streptococcus pyogenes

<400> 11
Glu Ile Glu Pro Lys Ile Lys Glu Leu Phe Glu Asn Asn Lys Asn Asn
 1               5                  10                  15
Gln Asp Lys Ser Trp Thr Glu Trp Ile Phe Asp Lys Leu Ser Leu Thr
            20                  25                  30
Glu Arg Ile Gln Lys Ala Lys Gln Glu Thr Leu Met Lys Leu Leu Glu
        35                  40                  45
Tyr Leu Phe Tyr Lys Arg Glu Tyr His Tyr Tyr Asn His Asn Leu Ser
    50                  55                  60
Ala Ile Ala Glu Ala Lys Met Ala Gln Gln Glu Gly Ile Thr Phe Tyr
65                  70                  75                  80
Ser Val Asp Val Thr Asp Leu Lys Thr Thr Ser Lys Arg Val Lys Arg
                85                  90                  95
Gln Val Glu Ser Thr Glu Asp Lys Lys Lys Glu Lys Asp Arg Glu Asp
            100                 105                 110
Ile Glu Lys Glu Arg Asn Glu Lys Phe Asp Asn Tyr Leu Lys Gln Met
        115                 120                 125
Ser Glu Gly Gly Lys Asp Phe Phe Glu Asp Val Asp Lys Ala Glu Lys
    130                 135                 140
Phe Lys Asp Ile Leu Thr Asn Val Thr Val Thr Glu Thr Phe Glu Asp
145                 150                 155                 160
Gly Val Asn Val Lys Asp Asn Ser Trp Gln Val Ser Ser Glu Asn Asn
                165                 170                 175
Asn Ser Leu His Ser Asn Tyr Lys Ser Val Thr His Lys Ala Ala Ser
            180                 185                 190
Asp Ala Ser Trp Trp Ser Leu Tyr Ser Asn Lys Glu Ser Leu Thr Trp
        195                 200                 205
Thr Ile Ser Lys Glu Gln Leu Lys Glu Ala Phe Glu Lys Asn Ser Ser
    210                 215                 220
Leu Thr Phe Lys Tyr Lys Leu Gln Val Asn Lys Gln Lys Leu Leu Asp
225                 230                 235                 240
Lys Asn Lys Asn Arg Thr Lys Arg Asp Thr Ser Thr Glu Asn Lys Thr
                245                 250                 255
Ser Val Thr Lys Asp Ile Ile Ser Asn Thr Val Asn Tyr Lys Ile Asn
            260                 265                 270
Asn Gln Glu Val Lys Gly Asn Lys Leu Asp Asp Val Lys Leu Thr Tyr
        275                 280                 285
Thr Lys Glu Thr Val Pro Val Pro Asp Val Glu Gly Glu Val Val Pro
    290                 295                 300
Ile Pro Glu Lys Pro Leu Val Glu Pro Met Thr Pro Leu Tyr Pro Ala
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305                 310                 315                 320
Ile Pro Asn Tyr Pro Thr Pro Asp Ile Pro Thr Pro Gln Leu Pro Lys
                325                 330                 335
Asp Glu Asp Leu Glu Ile Ser Gly Gly His Gly Pro Ser Val Asp Ile
            340                 345                 350
Val Glu Asp Thr Gly Thr Gly Ala Glu Gly Gly Ala Gln Asn Gly Val
        355                 360                 365
Val Ser Thr Gln Glu Asn Arg Asp Pro Ile Val Asp Ile Thr Glu Asp
    370                 375                 380
Thr Gln Pro Gly Met Ser Gly Ser Asn Asp Ala Thr Val Val Glu Glu
385                 390                 395                 400
Asp Thr Ala Pro Lys Arg Pro Asp Val Leu Val Gly Gly Gln Ser Asp
                405                 410                 415
Pro Ile Asp Ile Thr Glu Asp Thr Gln Pro Ser Val Ser Gly Ser Asn
            420                 425                 430
Asp Ala Thr Val Val Glu Glu Asp Thr Val Pro Lys Arg Pro Asp Ser
        435                 440                 445
Leu Val Gly Gly Gln Ser Glu Pro Ile Asp Ile Thr Glu Asp Thr Gln
    450                 455                 460
Pro Gly Met Ser Gly Ser Asn Gly Ala Thr Val Ile Glu Glu Asp Thr
465                 470                 475                 480
Arg Pro Lys Arg Val Phe His Phe Asp Asn Glu Pro Gln Ala Pro Glu
                485                 490                 495
Lys Pro Asn Glu Gln Pro Ser Leu Ser Leu Pro Gln Ala Pro Val Tyr
            500                 505                 510

Lys Ala Ala His His Leu Pro Ala Ser Gly Asp Lys Arg Glu Ala Ser
        515                 520                 525
Phe Thr Ile Ala Ala Pro Thr Ile Ile Gly Ala Ala Gly Leu Leu Ser
    530                 535                 540
Lys Lys Arg Arg Asp Thr Glu Gly Asn
545                 550
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<210> 12
<211> 1662
<212> DNA
<213> Streptococcus pyogenes

<400> 12

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gaaatagaac caaaaataaa agaattattt gaaaataaca agaataatca agataaatca      60
tggactgagt ggatatttga taaattatca ctgacagaga gaattcaaaa agctaagcag     120
gaaacactta tgaagctgct tgaatacctc ttttacaaac gtgaatacca ctactataat     180
cacaacctct cagcgatagc tgaagctaaa atggctcaac aagaaggtat caccttctat     240
tccgttgatg ttactgattt aaaaacaact tctaaaagag tgaagcgaca agtagaaagt     300
acagaggata agaaaaaaga aaaagatagg gaagacattg aaaaagaacg taacgaaaag     360
tttgataatt acttaaaaca aatgtctgaa ggcggtaagg atttttttga agatgttgat     420
aaggcagaaa aatttaaaga tatcttaact aatgtaacgg tgaccgagac ttttgaagat     480
ggggttaacg ttaaggataa ttcatggcaa gtttcatcag agaataataa tagcttacat     540
agtaattata agagtgttac acataaagca gcatctgatg caagttggtg gtctttgtat     600
agtaacaaag aaagtcttac ttggaccatt tctaaagagc agctcaaaga agcctttgag     660
aaaaatagtt ctctcacttt caagtacaag ttacaggtaa ataaacaaaa actattagat     720
aaaaacaaga atagaacaaa acgtgataca tctacggaaa ataagacttc tgtaacgaaa     780
gacattattt caaatactgt taactacaaa attaataatc aagaagttaa gggtaacaaa     840
cttgatgatg tcaagttgac ttatactaaa gagaccgttc ctgttccaga tgtggaagga     900
gaagttgtac caataccaga aaaaccactg gtagagccaa tgacgcctct atatcctgca     960
attcctaatt acccaacacc agatatccct acccctcaac ttccaaaaga tgaagatctg    1020
gagattagtg gaggtcatgg accgagtgtc gatatcgtcg aagatactgg tacaggtgct    1080
```

```
gagggcggcg ctcaaaacgg cgtggtttca actcaggaga atagagatcc aatcgttgac    1140
atcaccgaag atacccaacc aggtatgtca ggctcaaatg acgcgacagt tgtcgaggaa    1200
gacacagcac ctaaacgtcc agatgtcctt gttggtggtc aaagtgatcc aatcgatatc    1260
accgaagata cccaaccaag tgtgtcaggc tcaaatgacg cgacagttgt cgaggaagac    1320
acagtaccta aacgtccaga tagccttgtt ggcggtcaaa gtgatccaat cgacatcacc    1380
gaagataccc aaccaggcat gtcaggctca aatggcgcta ctgttatcga agaagatacg    1440
agaccaaaac gcgtcttcca ctttgataac gagccacaag caccagaaaa acctaacgag    1500
caaccatctc tcagcttacc acaagcgcca gtctataagg cagctcatca cttgcctgca    1560
tctggagaca aacgtgaagc atcctttaca attgctgctc caacaattat tggagctgca    1620
ggtttgctca gcaaaaaacg tcgcgacacc gaaggaaact aa                       1662
```

<210> 13
<211> 456
<212> PRT
<213> Streptococcus pyogenes

<400> 13

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Ser Thr Glu Thr Ser Thr Ala Ser Ala Gly Val Gly Thr Ser Gly Thr
 1               5                  10                  15
Ala Ala Ser Glu Thr Gly Ser Gly Ala Ala Val Thr Thr Ala Thr Thr
            20                  25                  30
Thr Thr Ala Thr Thr Asn Gly Gly Pro Gln Ser Thr Pro Ala Val Ala
        35                  40                  45
Glu Ala Thr Pro Gln Pro Gln Ala Gln Ile Ala Pro Val Ala Ala Ala
    50                  55                  60
Thr Ser Thr Ser Ser Ala Ser Ser Ser Ser Asp Gly Lys Ala Pro Gln
65                  70                  75                  80
Ala Val Thr Ser Ser Thr Ser Pro Ser Thr Pro Ala Ala Ala Ser Ser
                85                  90                  95
Asn Gly Ser Asn Gln Glu Ala Ser Ala Glu Thr Glu Pro Gln Thr Met
            100                 105                 110
Glu Val Glu Lys Tyr Thr Val Asp Lys Glu Asn Ser Lys Leu Asn Ile
        115                 120                 125
Lys Asp Gly Lys Thr Pro Lys Thr Gly Ser Ser Val Asn Asn Glu Lys
    130                 135                 140
Asp Thr Lys Leu Ile Arg Asn Arg Asp Gly Lys Leu Arg Asp Ile Val
145                 150                 155                 160
Asp Val Thr Arg Thr Val Lys Thr Asn Glu Asp Gly Thr Ile Asp Val
                165                 170                 175
Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met
            180                 185                 190
Ala Leu Leu Asp Val Ser Lys Lys Met Ser Glu Asp Asp Phe Asn Asn
        195                 200                 205
Ala Lys Asn Lys Ile Lys Lys Leu Val Lys Thr Leu Thr Ser Lys Ser
    210                 215                 220
Ala Ser Asn Ser Asp Asn Asp Glu His Lys Tyr Asn Ser Arg Asn Ser
225                 230                 235                 240
Val Arg Leu Met Thr Phe Tyr Arg Glu Ile Ser Asn Pro Ile Asp Ile
                245                 250                 255
Ser Gly Lys Thr Glu Glu Gln Leu Asp Lys Leu Leu Asp Asp Leu Arg
            260                 265                 270
Lys Lys Ala Lys Ala Asn Tyr Asp Trp Gly Val Asp Leu Gln Gly Ala
        275                 280                 285
Ile His Lys Ala Arg Glu Ile Phe Asn Lys Glu Lys Glu Lys Lys Phe
    290                 295                 300
Gly Lys Arg Arg His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe
305                 310                 315                 320
```

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Ser Tyr Glu Leu Gln Asn Ser Val Arg Glu Asp Lys Thr Lys Leu Ser
                325                 330                 335
Arg Leu Ser Gly Ala Val Thr Ser Ser Asn Pro Leu Leu Pro Trp Pro
            340                 345                 350
Pro Ile Phe Asn His Thr His Lys Asn Ile Asp Met Leu Asp Asp Val
        355                 360                 365
Lys Asn Leu Val Lys Leu Gly Gln Thr Leu Gly Ile Ala Gly Leu Asp
    370                 375                 380
Asn Leu Gln Ser Thr Leu Ser Leu Ile Ser Thr Gly Ser Ser Leu Ala
385                 390                 395                 400
Gly Ala Phe Leu Gly Gly Gly Ser Leu Thr Glu Tyr Leu Thr Leu Lys
                405                 410                 415
Glu Tyr Lys Ser Gly Asp Leu Lys Glu Asn Gln Phe Asp Tyr Thr Lys
            420                 425                 430
Arg Val Gly Glu Gly Tyr His Phe His Ser Phe Ser Glu Arg Lys Lys
        435                 440                 445
Thr Gly Glu Ile Pro Phe Lys Ser
    450                 455
```

<210> 14
<211> 1365
<212> DNA
<213> Streptococcus pyogenes

<400> 14

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actgagacga gtactgctag cgctggtgtc ggtacgagtg ggacggccgc cagcgaaact      60
gggagtggag cagccgtaac tactgccact actaccaccg ctactaccaa tggaggaccc     120
cagtctactc cagcagtagc tgaagcgact ccacaacctc aagcacagat agctccagta     180
gcagcagcaa cgtcgacatc atcggcttct tctagtagtg acgggaaagc tcctcaggca     240
gtaacttcat ctacatcacc ttcaactcca gcagcagcca gtagtaatgg tagcaatcaa     300
gaagctagtg ctgagactga gccacagacg atggaagtgg aaaagtatac agttgataag     360
gaaaattcaa agctaaatat taaagacggt aagactccaa aaactgggag tagtgttaat     420
aatgaaaaag acacaaaact tattagaaac cgcgatggca aacttcgtga tattgttgat     480
gttactcgga cagttaaaac taacgaagat ggcactattg atgttaccgt aacggttaaa     540
ccgaagcaaa ttgacgaagg tgccgatgtt atggcccttt tagatgtctc taaaaagatg     600
tcagaagatg attttaacaa cgctaagaat aagatcaaga aattagtcaa aaccttaacg     660
agtaaatcag cgagtaactc agataatgat gagcataaat ataattctcg aaattcggtt     720
cgtctgatga ccttttaccg tgagattagc aacccaattg atatatcagg aaaaaccgag     780
gaacaacttg ataaattatt agacgatctt cgcaaaaaag ctaaagctaa ttatgactgg     840
ggggttgatt tacagggagc tatccacaag gctcgagaga tttttaataa ggaaaaagaa     900
aaaaaatttg gtaaacgccg gcatatcgtc ctattctctc aaggcgagtc aacctttagt     960
tatgaacttc aaaatagtgt tagagaagat aaaactaagt tatcccgatt aagtggagca    1020
gttacttcgt ccaaccctct gctaccctgg ccacctattt ttaatcatac gcataaaaat    1080
atagacatgc ttgacgatgt aaagaatttg gtaaaactag gtcaaacttt aggaattgca    1140
gggctagata atttacagag tacattgagc ttaatatcga caggaagttc tctggcagga    1200
gcgtttttag gggggggggag tctgacagaa tacctcactc taaaggagta taaatcagga    1260
gacttaaaag aaaatcagtt tgattatacc aaacgtgttg gtgaaggata tcatttccat    1320
agtttttctg agagaaaaaa aactggcgaa ataccgttta agagt                    1365
```

<210> 15
<211> 19
<212> PRT
<213> Streptococcus pyogenes

<400> 15

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Glu Thr Glu Pro Gln Thr Met Asp Val Glu Gln Tyr Thr Val Asp Lys
 1               5                  10                  15
```

Glu Asn Ser

<210> 16
<211> 21
<212> PRT
<213> Streptococcus pyogenes

<400> 16
Asp Ile Phe Asp Val Lys Arg Glu Val Lys Thr Asn Gly Asp Gly Thr
 1   5   10   15
Leu Asp Val Leu Thr
            20

<210> 17
<211> 20
<212> PRT
<213> Streptococcus pyogenes

<400> 17
Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val
 1   5   10   15
Ser Gln Lys Met
            20

<210> 18
<211> 16
<212> PRT
<213> Streptococcus pyogenes

<400> 18
Phe Asp Lys Ala Lys Glu Gln Ile Lys Lys Leu Val Thr Thr Leu Thr
 1   5   10   15

<210> 19
<211> 14
<212> PRT
<213> Streptococcus pyogenes

<400> 19
Tyr Asn Arg Arg Asn Ser Val Arg Leu Met Thr Phe Tyr Arg
 1   5   10

<210> 20
<211> 20
<212> PRT
<213> Streptococcus pyogenes

<400> 20
Trp Gly Asp Val Leu Gln Gly Ala Ile His Lys Ala Arg Glu Ile Phe
 1   5   10   15
Asn Lys Glu Lys
            20

<210> 21
<211> 19
<212> PRT

<213> Streptococcus pyogenes

<400> 21
Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe Ser Tyr
 1   5   10   15
Asp Ile Lys

<210> 22
<211> 16
<212> PRT
<213> Streptococcus pyogenes

<400> 22
Thr Thr Ser Asn Pro Leu Phe Pro Trp Leu Pro Ile Phe Asn His Thr
 1   5   10   15

<210> 23
<211> 19
<212> PRT
<213> Streptococcus pyogenes

<400> 23
Phe Asp Tyr Ser Lys Arg Val Gly Glu Gly Tyr Tyr Tyr His Ser Phe
 1   5   10   15
Ser Asp Arg

<210> 24
<211> 18
<212> PRT
<213> Streptococcus pyogenes

<400> 24
Glu Arg Asn Glu Lys Phe Asp Asn Tyr Leu Lys Glu Met Ser Glu Gly
 1   5   10   15
Gly Lys

<210> 25
<211> 15
<212> PRT
<213> Streptococcus pyogenes

<400> 25
Asp Val Asp Lys Ala Asp Lys Phe Lys Asp Thr Leu Thr Glu Leu
 1   5   10   15

<210> 26
<211> 12
<212> PRT
<213> Streptococcus pyogenes

<400> 26
Thr Lys Glu Ser Leu Thr Trp Thr Ile Ser Lys Asp
 1   5   10

<210> 27
<211> 15
<212> PRT
<213> Streptococcus pyogenes

<400> 27
Ser Leu Thr Leu Lys Tyr Lys Leu Lys Val Asn Lys Asp Lys Leu
 1   5   10   15

<210> 28
<211> 102
<212> PRT
<213> Streptococcus pyogenes

<400> 28
Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser Gly Ser Asn Asp Ala
 1   5   10   15
Thr Val Val Glu Glu Asp Thr Ala Pro Gln Arg Pro Asp Val Leu Val
            20   25   30
Gly Gly Gln Ser Asp Pro Ile Asp Ile Thr Glu Asp Thr Gln Pro Gly
        35   40   45
Met Ser Gly Ser Asn Asp Ala Thr Val Val Glu Glu Asp Thr Val Pro
    50   55   60
Lys Arg Pro Asp Ile Leu Val Gly Gly Gln Ser Asp Pro Ile Asp Ile
65   70   75   80
Thr Glu Asp Thr Gln Pro Gly Met Ser Gly Ser Asn Asp Ala Thr Val
                85   90   95
Ile Glu Glu Asp Thr Lys
            100

<210> 29
<211> 34
<212> PRT
<213> Streptococcus pyogenes

<400> 29
Gly Ala Ser Ser Val Ala Ser Ser Ala Ser Ser Ser Ser Asn Gly Ser
 1   5   10   15
Val Ala Ser Ser Ser Glu Pro Gln Met Pro Gln Ala Gln Thr Ala Pro
            20   25   30
Gln Met

<210> 30
<211> 246
<212> PRT
<213> Streptococcus pyogenes

<400> 30
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Thr Gly Ser Thr
 1   5   10   15
Glu Thr Ser Ala Ala Ser Thr Thr Thr Asn Thr Ala Ser Thr Val Glu
            20   25   30
Thr Ser Thr Thr Thr Gly Thr Ser Val Thr Ala Ala Ser Glu Ala Ser
        35   40   45
Ser Glu Ser Ser Asp Ala Ser Val Val Ser Ser Gly Gly Arg Gln Thr

```
    50                  55                  60
Ser Glu Ser Ala Gln Ala Ser Lys Gln Pro Gln Ala Gln Thr Ala Val
65                  70                  75                  80
Ala Ser Ser Ser Ser Ser Ser Lys Ala Asn Glu Ser Ser Ser Ser Ala
                85                  90                  95
Ser Asp Val Lys Ala Pro Lys Ala Val Ser Thr Thr Ser Ser Ser Ala
            100                 105                 110
Thr Val Ala Ser Pro Ser Asn Gly Ser Asn Lys Glu Ala Asn Ala Glu
        115                 120                 125
Thr Glu Pro Gln Gln Met Met Glu Val Glu Lys Tyr Thr Val Asp Lys
    130                 135                 140
Glu Asn Ser Glu Leu Lys Val Lys Asp Gly Thr Gln Pro Lys Lys Gly
145                 150                 155                 160
Ser Thr Val Asn Glu Asn Thr Lys Leu Ile Arg Asn Arg Asp Gly Lys
                165                 170                 175
Gln Arg Asp Ile Val Asp Val Thr Arg Thr Val Lys Thr Asn Glu Asp
            180                 185                 190
Gly Thr Ile Asp Val Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu
        195                 200                 205
Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Thr Gln
    210                 215                 220
Glu Asn Phe Asp Lys Ala Lys Glu Gln Ile Lys Lys Met Val Thr Thr
225                 230                 235                 240
Leu Thr Ser Lys Thr Asp
                245
```

<210> 31
<211> 923
<212> PRT
<213> Streptococcus pyogenes

<400> 31

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Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Ala Asn Thr Glu Thr
 1               5                  10                  15
Ser Thr Thr Pro Ala Thr Thr Thr Pro Ser Ala Gly Thr Gly Thr Ala
            20                  25                  30
Thr Thr Ser Gly Thr Ala Thr Thr Thr Pro Ser Ala Thr Thr Asp Ala
        35                  40                  45
Gly Gly Ala Ala Gly Ser Gly Thr Asn Gly Ala Ser Ser Val Thr Ser
    50                  55                  60
Ser Gly Gly Ser Gln Ser Ser Glu Ser Ala Gln Ala Ser Pro Gln Ala
65                  70                  75                  80
Gln Ala Ala Pro Ala Ala Ala Glu Thr Thr Pro Lys Ala Gln Ala Gln
                85                  90                  95
Thr Ala Thr Val Ala Ser Ala Ser Thr Thr Ala Ser Ser Ser Ser Ser
            100                 105                 110
Asp Gly Lys Ala Pro Gln Ala Ala Ser Thr Thr Ser Ser Ser Thr Pro
        115                 120                 125
Ala Val Ala Ser Asn Asn Ser Asn Gln Glu Ala Gly Thr Glu Ala Glu
    130                 135                 140
Thr Pro Met Met Glu Val Glu Gln Tyr Thr Val Asp Asn Lys Ala Thr
145                 150                 155                 160
Glu Leu Asn Ile Lys Asp Gly Lys Asn Leu Lys Asn Gly Ser Arg Val
                165                 170                 175
Val Asp Lys Asn Thr Lys Leu Ile Arg Asn Arg Asp Gly Glu Gln Arg
            180                 185                 190
Asp Ile Val Asp Ile Lys Arg Glu Val Lys Thr Asn Ala Asp Gly Thr
```

```
        195                 200                 205
Ile Asp Val Thr Val Thr Val Thr Pro Lys Glu Ile Asp Glu Gly Ala
    210                 215                 220
Asp Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Thr Asp Ala Asp
225                 230                 235                 240
Phe Lys Asn Ala Lys Asp Lys Ile Lys Lys Leu Val Thr Thr Leu Thr
                245                 250                 255
Ser Asn Ser Asp Asn Ala Glu His Lys His Asn Ser Arg Asn Ser Val
            260                 265                 270
Arg Leu Met Thr Phe Tyr Arg Glu Ile Ser Asp Pro Ile Asp Ile Ser
        275                 280                 285
Gly Lys Thr Asp Ala Glu Leu Asp Lys Ile Leu Asn Asp Leu Arg Glu
    290                 295                 300
Lys Ala Lys Ala Asn Tyr Asp Trp Gly Val Asp Leu Gln Gly Ala Ile
305                 310                 315                 320
His Lys Ala Arg Glu Ile Phe Lys Lys Asp Gln Glu Lys Lys Ser Gly
                325                 330                 335
Lys Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe Ser
            340                 345                 350
Tyr Asp Ile Asn Asp Lys Thr Lys Leu Lys Thr Ile Thr Glu Asp Lys
        355                 360                 365
Ile Thr Thr Ser Asn Pro Leu Phe Pro Trp Leu Pro Ile Phe Asn His
    370                 375                 380
Thr Asn Arg Lys Ala Asp Met Leu Asp Asp Ile Ala Lys Val Ile Lys
385                 390                 395                 400
Lys Val Lys Gly Leu Gly Val Glu Ser Val Gly Thr Ala Glu Ser Val
                405                 410                 415
Leu Ser Ala Leu Thr Ala Leu Asn Lys Leu Gly Ser Leu Leu Thr Gly
            420                 425                 430
Ser Met Thr Glu Tyr Ile Thr Leu Lys Glu Tyr Asp Ser Asp Lys Leu
        435                 440                 445
Gly Ala Glu Arg Phe Asp Tyr Thr Lys Arg Val Gly Glu Gly Tyr Tyr
    450                 455                 460
Tyr His Ser Phe Ser Asp Arg Lys Ser Glu Asp Thr Met Phe Phe Ser
465                 470                 475                 480
Asp Arg Lys Ser Glu Asp Thr Met Pro Phe Glu Ser Glu Ile Met Ala
                485                 490                 495
Gly Leu Lys Ser His Leu Pro Lys Phe Lys Glu Gly Asp Trp Phe Thr
            500                 505                 510
Asn Val Leu Gln Tyr Phe Gly Leu Lys Glu Lys Ala Glu Gln Ala Lys
        515                 520                 525
Leu Asp Val Ile Met Lys Val Ile Lys Ser Val Phe Tyr Lys Arg Gln
    530                 535                 540
Tyr His Tyr Tyr Asn His Asn Leu Ser Ala Ile Ala Glu Ala Lys Met
545                 550                 555                 560
Ala Gln Glu Glu Gly Ile Thr Phe Tyr Ser Val Asp Val Thr Asp Leu
                565                 570                 575
Lys Thr Thr Ser Thr Arg Val Lys Arg Gln Thr Ala Val Tyr Lys Asp
            580                 585                 590
Asp Lys Lys Lys Glu Ile Glu Glu Arg Asn Asn Lys Phe Asp Lys Tyr
        595                 600                 605
Leu Lys Glu Met Ser Glu Gly Lys Thr Phe Leu Glu Asp Lys Asp Val
    610                 615                 620
Thr Asn Lys Asp Lys Phe Lys Asp Thr Leu Thr Glu Leu Thr Ile Lys
625                 630                 635                 640
Asp Glu Phe Ser Asp Lys Val Lys Val Glu Glu Asn Ser Trp Asn Lys
                645                 650                 655
```

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Pro Val Ala Asp Glu Leu Lys Asn Ser Asn Lys Asn Ser Ile Thr His
            660                 665                 670
Gln Lys Ala Ser Ser Trp Phe Leu Arg Ser Thr Lys Glu Ser Leu Thr
        675                 680                 685
Trp Thr Ile Ser Lys Asp Gln Leu Lys Lys Ala Phe Glu Asp Gly Lys
    690                 695                 700
Pro Leu Thr Leu Thr Tyr Lys Leu Lys Val Asp Asn Asn Lys Phe Lys
705                 710                 715                 720

Thr Ala Leu Glu Glu Glu Lys Lys Lys Arg Ala Lys Arg Ser Thr Pro
                725                 730                 735
Thr Glu Asn Glu Asn Ser Val Thr Glu Lys Ile Ile Ser Asn Thr Ile
            740                 745                 750
Thr Tyr Gln Ile Asn Gln Lys Lys Gly Thr Asp Lys Ser Leu Gly Asp
        755                 760                 765
Val Lys Leu Thr Tyr Ser Lys Leu Lys Val Pro Val Pro Gln Ile Asp
    770                 775                 780
Gly His Val Ile Glu Pro Gln Ala Pro Thr Leu Pro Lys Leu Pro Pro
785                 790                 795                 800
Val Ile Glu His Gly Pro Asn Phe Glu Tyr Glu Glu Glu Thr Gly Tyr
                805                 810                 815
Gln Leu Pro Leu Lys His Gly Ser Asn Ala Pro Asp Thr Gln Val Thr
            820                 825                 830
Ile Glu Glu Asp Thr Val Pro Gln Arg Pro Asp Ile Leu Val Gly Gly
        835                 840                 845
Gln Ser Gly Pro Val Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser
    850                 855                 860
Gly Ser Asn Asp Ala Thr Val Val Glu Glu Asp Thr Ala Pro Lys Arg
865                 870                 875                 880
Pro Asp Val Leu Val Gly Gly Gln Ser Asp Pro Ile Asp Ile Thr Glu
                885                 890                 895
Asp Thr Gln Pro Ser Val Ser Gly Ser Asn Asp Ala Thr Val Val Glu
            900                 905                 910
Glu Asp Thr Val Pro Lys Arg Pro Asp Ile Leu
        915                 920

<210> 32
<211> 454
<212> PRT
<213> Streptococcus pyogenes

<400> 32
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Thr Gly Ser Thr
 1               5                  10                  15
Glu Thr Ser Ala Ala Ser Thr Ala Ser Val Asp Ala Thr Thr Ser Gly
            20                  25                  30
Thr Thr Ala Ser Gly Ala Ser Gly Glu Ser Ser Asp Ala Ser Val Ala
        35                  40                  45
Ser Ser Glu Gly Ser Gln Gly Ser Glu Ser Ala Pro Ala Ser Pro Gln
    50                  55                  60
Pro Gln Pro Gln Ala Gln Thr Ala Pro Ala Ala Thr Ser Ala Ser Ser
65                  70                  75                  80
Lys Ala Lys Thr Glu Glu Gln Thr Pro Lys Ala Ala Thr Ser Ser Thr
                85                  90                  95
Pro Ser Thr Pro Ala Ala Ser Ser Ser Ser Asn Ser Asn Gln Glu Ala
            100                 105                 110
Ser Ala Glu Thr Glu Pro Gln Met Met Asp Val Glu Lys Tyr Thr Val
```

```
        115                 120                 125
Asp Lys Glu Ser Ser Glu Leu Lys Val Lys Asp Gly Lys Lys Pro Lys
    130                 135                 140
Asn Glu Asn Lys Val Asp Lys Asp Thr Lys Leu Ile Arg Asn Arg Asp
145                 150                 155                 160
Gly Glu Gln Arg Asp Ile Phe Asp Ile Lys Arg Glu Val Lys Thr Asn
                165                 170                 175
Ala Asp Gly Thr Ile Asp Val Thr Val Thr Val Thr Pro Lys Glu Ile
            180                 185                 190
Asp Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Gln Lys Met
        195                 200                 205
Thr Lys Glu Asn Phe Asp Lys Ala Lys Glu Gln Ile Lys Lys Met Val
    210                 215                 220
Thr Thr Leu Thr Gly Glu Pro Thr Asp Gly Lys Glu Asn Arg Asn Arg
225                 230                 235                 240
Arg Asn Ser Val Arg Leu Met Thr Phe Tyr Arg Lys Ile Ser Glu Pro
                245                 250                 255
Ile Asp Leu Ser Gly Lys Thr Ser Glu Glu Val Glu Lys Glu Leu Asp
            260                 265                 270
Asn Ile Trp Asp Lys Val Lys Lys Glu Asp Trp Asp Trp Gly Val Asp
        275                 280                 285
Leu Gln Gly Ala Ile His Lys Ala Arg Asp Ile Phe Lys Lys Glu Lys
    290                 295                 300
Glu Ser Lys Lys Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser
305                 310                 315                 320
Thr Phe Ser Tyr Asp Ile Asn Asp Lys Asp Lys Asn Asn Thr Val Arg
                325                 330                 335
Lys Asn Arg Ile Thr Gly Lys Val Thr Thr Ser Asn Pro Leu Phe Pro
            340                 345                 350
Trp Leu Pro Ile Phe Asn His Thr Asn Gln Lys Ala Glu Val Ile Asp
        355                 360                 365
Asp Val Asp Lys Leu Leu Asp Phe Ala Glu Lys Met Gly Ile Ser Leu
    370                 375                 380
Pro Lys Gly Leu Arg Ala Gly Val Gln Ala Ile Gly Leu Ser Asn Ser
385                 390                 395                 400
Phe Leu Ser Thr Phe Thr Gly Ser Gly Leu Thr Glu Tyr Leu Thr Leu
                405                 410                 415
Asn Glu Tyr Gly Ser Asp Ile Leu Lys Glu Lys Gln Phe Asp Tyr Thr
            420                 425                 430
Lys Arg Val Gly Glu Gly Tyr Tyr Tyr His Ser Tyr Ser Lys Arg Thr
        435                 440                 445
His Gly Asp Lys Met Pro
    450
```

<210> 33
<211> 409
<212> PRT
<213> Streptococcus pyogenes

<400> 33

```
Glu Thr Ser Thr Thr Thr Ser Thr Ser Gly Thr Ala Ala Ser Gly Ala
 1               5                  10                  15
Gly Ser Glu Ser Ser Asp Ala Ser Val Val Pro Ser Glu Gly Ser Gln
            20                  25                  30
Ser Ser Gly Thr Thr Thr Pro Ala Ser Lys Gln Pro Gln Ala Gln Thr
        35                  40                  45
Ala Pro Ala Ala Thr Ser Ala Ser Ser Thr Ser Ser Ser Ser Ser Asp
```

```
    50                  55                  60
Gly Lys Ala Pro Gln Ala Ala Thr Ile Ser Thr Ser Ser Thr Pro Ala
65                  70                  75                  80
Ala Gly Thr Ser Ser Asn Ser Asn Gln Val Thr Gly Thr Glu Ala Glu
                85                  90                  95
Pro Gln Thr Met Asp Val Glu Arg Tyr Thr Val Asp Lys Glu Asn Ser
            100                 105                 110
Lys Leu Asn Ile Lys Asp Gly Asp Lys Pro Lys Asn Arg Ser Ser Val
        115                 120                 125
Asp Lys Asp Thr Lys Leu Ile Arg Asn Arg Asp Gly Lys Gln Arg Asp
    130                 135                 140
Ile Val Asp Val Thr Arg Thr Val Lys Thr Asn Glu Asp Gly Thr Ile
145                 150                 155                 160
Asp Val Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp
                165                 170                 175
Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Ser Glu Asp Asp Phe
            180                 185                 190
Asn Asn Ala Lys Asp Lys Ile Lys Lys Leu Val Thr Thr Leu Thr Ser
        195                 200                 205
Lys Ser Ala Asn Gly Gln Gln Asn Leu Asn Asn Arg Asn Thr Val Arg
    210                 215                 220
Leu Met Thr Phe Tyr Arg Lys Ile Ser Asp Pro Ile Asp Leu Ser Gly
225                 230                 235                 240
Lys Thr Ser Glu Glu Val Glu Glu Glu Leu Asn Lys Ile Trp Asp Lys
                245                 250                 255
Val Lys Thr Lys Asp Trp Asp Trp Gly Val Asp Leu Gln Gly Ala Ile
            260                 265                 270
His Lys Ala Arg Asp Ile Phe Lys Lys Glu Lys Glu Ser Lys Lys Arg
        275                 280                 285
Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe Ser Tyr Glu
    290                 295                 300
Leu His Asn Ser Val Lys Glu Asp Lys Tyr Lys Leu Ser Arg Leu Thr
305                 310                 315                 320
Glu Thr Val Thr Ser Ser Asn Pro Leu Leu Pro Trp Pro Pro Ile Phe
                325                 330                 335
Asn His Thr His Lys Asn Ile Asp Met Leu Asp Asp Val Lys His Leu
            340                 345                 350
Ile Lys Leu Gly Gln Ala Leu Gly Ile Lys Glu Leu Asp Ser Leu Gln
        355                 360                 365

Ser Thr Leu Lys Leu Val Ser Ala Gly Ser Asn Ala Ala Gly Leu Leu
    370                 375                 380
Leu Gly Gly Gly Ser Leu Thr Glu Tyr Leu Thr Leu Lys Glu Tyr Lys
385                 390                 395                 400
Ser Gly Asn Leu Thr Glu Asn Gln Phe
                405
```

<210> 34
<211> 232
<212> PRT
<213> Streptococcus pyogenes

<400> 34

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Ser Ala Ser Ser
 1               5                  10                  15
Thr Glu Thr Ser Ala Asn Thr Asn Thr Asn Thr Ser Thr Ala Ser Ala
            20                  25                  30
```

```
Gly Thr Gly Thr Ser Gly Thr Ala Ser Thr Thr Pro Ser Val Gly Thr
        35                  40                  45
Ser Thr Gly Gly Ala Ala Gly Gly Glu Ala Ala Val Ala Ser Ser Gly
    50                  55                  60
Gly Ser Gln Ser Ser Asp Thr Thr Pro Ala Ser Pro Gln Ala Gln Thr
65                  70                  75                  80
Ser Glu Gln Pro Ala Ala Thr Ser Thr Ser Ser Asn Ser Ser Ser Asp
                85                  90                  95
Gly Gln Thr Pro Lys Thr Ala Thr Thr Ser Pro Ser Thr Pro Val Val
            100                 105                 110
Ala Asn Ser Asn Gly Asn Gln Val Thr Gly Thr Glu Ala Ser Pro Gln
        115                 120                 125
Met Met Asp Val Glu Lys Tyr Thr Val Asp Lys Glu Ser Ser Glu Leu
    130                 135                 140
Asn Ile Lys Asp Gly Lys Thr Pro Lys Asn Gly Ile Ser Val Thr Lys
145                 150                 155                 160
Asp Thr Lys Leu Ile Arg Asn Arg Asp Gly Lys Gln Arg Asp Ile Val
                165                 170                 175
Asp Val Thr Arg Thr Val Lys Ala Asn Glu Asp Gly Thr Ile Asp Val
            180                 185                 190
Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met
        195                 200                 205
Ala Leu Leu Asp Val Ser Lys Lys Met Thr Gln Glu Asn Phe Asp Lys
    210                 215                 220
Ala Lys Glu Gln Ile Lys Lys Leu
225                 230
```

<210> 35
<211> 250
<212> PRT
<213> Streptococcus pyogenes

<400> 35

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Thr Gly Ser Thr
 1               5                  10                  15
Glu Thr Ser Ala Ala Ser Thr Ala Ser Pro Gly Thr Gly Thr Ala Thr
            20                  25                  30
Thr Ser Val Thr Ala Ala Ser Gly Ala Gly Ser Glu Ala Thr Glu Ala
        35                  40                  45
Thr Ala Thr Thr Thr Asn Gly Gly Pro Gln Ser Ala Thr Val Thr Ser
    50                  55                  60
Glu Ala Thr Pro Lys Ala Gln Ala Gln Thr Ser Glu Gln Pro Ala Ala
65                  70                  75                  80
Thr Ser Ala Ser Ser Thr Ser Ser Ser Lys Ala Lys Thr Glu Glu Gln
                85                  90                  95
Thr Pro Lys Ala Ala Thr Ser Ser Thr Pro Ser Thr Pro Ala Ala Ser
            100                 105                 110
Ser Ser Ser Asn Ser Asn Gln Gly Ala Ser Thr Glu Thr Glu Pro Gln
        115                 120                 125
Met Met Glu Val Glu Gln Tyr Lys Val Asp Lys Glu Glu Thr Glu Leu
    130                 135                 140
Lys Val Lys Asp Gly Asn Gln Pro Lys Asn Glu Arg Ser Val Ser Gln
145                 150                 155                 160
Asn Thr Lys Leu Ile Arg Asn Arg Asp Gly Glu Gln Arg Asp Ile Val
                165                 170                 175
Asp Ile Lys Arg Glu Val Lys Asp Asn Gly Asp Gly Thr Leu Asp Val
            180                 185                 190
```

```
Thr Leu Lys Val Thr Pro Lys Glu Ile Asp Lys Gly Ala Asp Val Met
        195                 200                 205
Ala Leu Leu Asp Val Ser Gln Lys Met Thr Asp Ala Asp Phe Asp Asn
    210                 215                 220
Ala Lys Glu Lys Ile Lys Lys Leu Val Thr Thr Leu Thr Ser Lys Ser
225                 230                 235                 240
Asn Ser Asp Glu His Lys His Asn Ser Arg
                245                 250
```

<210> 36
<211> 197
<212> PRT
<213> Streptococcus pyogenes

<400> 36

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Glu Thr Ser Thr
 1               5                  10                  15
Thr Ser Thr Ala Ser Thr Thr Thr Gly Thr Ser Gly Thr Ala Thr Thr
            20                  25                  30
Thr Pro Ser Ala Ile Thr Gly Thr Asp Gly Ala Ala Gly Ser Gly Thr
        35                  40                  45
Ser Asp Val Ser Val Val Ser Ser Glu Gly Ser Gln Ser Ser Glu Ser
    50                  55                  60
Ala Gln Ala Ser Pro Gln Ala Gln Thr Ala Thr Val Ala Ser Ala Ser
65                  70                  75                  80
Thr Thr Ala Ser Pro Ser Ser Ser Ser Ala Ser Asp Gly Lys Ala Pro
                85                  90                  95
Gln Ala Ala Ser Thr Thr Ser Ser Ser Ala Thr Val Ala Asn Pro Ser
            100                 105                 110
Asn Gly Ser Asn Gln Val Thr Gly Thr Glu Val Glu Pro Gln Met Met
        115                 120                 125
Asp Val Glu Gln Tyr Lys Val Asn Lys Glu Lys Thr Glu Leu Thr Val
    130                 135                 140
Lys Asp Asp Lys Gln Gln Leu Lys Ile Arg Lys Asp Val Asp Glu Leu
145                 150                 155                 160
Lys Asn Lys Asp Leu Phe Asp Val Lys Arg Glu Val Lys Asp Asn Gly
                165                 170                 175
Asp Gly Thr Leu Asp Val Thr Leu Lys Val Met Pro Lys Gln Ile Asp
            180                 185                 190
Glu Gly Ala Asp Val
        195
```

<210> 37
<211> 873
<212> PRT
<213> Streptococcus pyogenes

<400> 37

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Ala Asn Thr Glu Thr
 1               5                  10                  15
Ser Thr Thr Pro Ala Thr Thr Thr Pro Ser Ala Gly Thr Gly Thr Ala
            20                  25                  30
Thr Thr Ser Gly Thr Ala Thr Thr Thr Pro Ser Ala Thr Thr Asp Ala
        35                  40                  45
Gly Gly Ala Ala Gly Ser Gly Thr Asn Gly Ala Ser Ser Val Thr Ser
    50                  55                  60
Ser Gly Gly Ser Gln Ser Ser Glu Ser Ala Gln Ala Ser Pro Gln Ala
```

```
65                  70                  75                  80
Gln Ala Ala Pro Ala Ala Ala Glu Thr Thr Pro Lys Ala Gln Ala Gln
                85                  90                  95
Thr Ala Thr Val Ala Ser Ala Ser Thr Thr Ala Ser Ser Ser Ser Ser
            100                 105                 110
Asp Gly Lys Ala Pro Gln Ala Ala Ser Thr Thr Ser Ser Ser Thr Pro
        115                 120                 125
Ala Val Ala Ser Asn Asn Ser Asn Gln Glu Ala Gly Thr Glu Ala Glu
    130                 135                 140
Thr Pro Met Met Glu Val Glu Gln Tyr Thr Val Asp Asn Lys Ala Thr
145                 150                 155                 160
Glu Leu Asn Ile Lys Asp Gly Lys Asn Leu Lys Asn Gly Ser Arg Val
                165                 170                 175
Val Asp Lys Asn Thr Lys Leu Ile Arg Asn Arg Asp Gly Glu Gln Arg
            180                 185                 190
Asp Ile Val Asp Ile Lys Arg Glu Val Lys Thr Asn Ala Asp Gly Thr
        195                 200                 205
Ile Asp Val Thr Val Thr Val Thr Pro Lys Glu Ile Asp Glu Gly Ala
    210                 215                 220
Asp Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Thr Asp Ala Asp
225                 230                 235                 240
Phe Lys Asn Ala Lys Asp Lys Ile Lys Lys Leu Val Thr Thr Leu Thr
                245                 250                 255
Ser Asn Ser Asp Asn Ala Glu His Lys His Asn Ser Arg Asn Ser Val
            260                 265                 270
Arg Leu Met Thr Phe Tyr Arg Glu Ile Ser Asp Pro Ile Asp Ile Ser
        275                 280                 285
Gly Lys Thr Asp Ala Glu Leu Asp Lys Ile Leu Asn Asp Leu Arg Glu
    290                 295                 300
Lys Ala Lys Ala Asn Tyr Asp Trp Gly Val Asp Leu Gln Gly Ala Ile
305                 310                 315                 320
His Lys Ala Arg Glu Ile Phe Lys Lys Asp Gln Glu Lys Lys Ser Gly
                325                 330                 335
Lys Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe Ser
            340                 345                 350
Tyr Asp Ile Lys Asn Lys Asn Asp Ser Lys Leu Lys Lys Ala Arg Leu
        355                 360                 365
Thr Thr Val Thr Thr Ser Asn Pro Leu Phe Ser Trp Phe Pro Ile Phe
    370                 375                 380
Asp Arg Thr Asn Arg Lys Ala Asp Met Leu Asp Gly Phe Asp Lys Leu
385                 390                 395                 400
Leu Ser Ile Ala Gln Lys Phe Gly Val Glu Ile Pro Asn Gly Leu Lys
                405                 410                 415
Thr Gly Leu Lys Ala Ala Ala Thr Thr Asn Ser Leu Leu Ser Ser Phe
            420                 425                 430
Thr Gly Gly Asp Gly Leu Thr Asp Tyr Leu Thr Leu Arg Glu Tyr Met
        435                 440                 445
Ala Asp Lys Leu Gln Glu Thr Asp Phe Asn Tyr Ser Asn Arg Val Gly
    450                 455                 460
Glu Gly Tyr His His His Ser Phe Ser Glu Arg Asn Thr His Asp Met
465                 470                 475                 480
Pro Met Lys Glu Thr Leu Glu Lys Leu Leu Asp Ser Gln Ile Pro Arg
                485                 490                 495
Leu Asp Lys Glu Ser Trp Phe Gly Trp Ala Leu Asp Lys Leu Ser Leu
            500                 505                 510
Thr Glu Thr Tyr Gln Asn Gly Gln Lys Val Ala Leu Met Lys Ile Leu
        515                 520                 525
```

```
Asp Tyr Leu Phe Tyr Lys Arg Glu Tyr Val Tyr Tyr Asn His Asn Leu
    530                 535                 540
Ser Ala Ile Ala Glu Ala Lys Met Ala Gln Gln Glu Gly Ile Thr Phe
545                 550                 555                 560
Tyr Ser Val Asp Val Thr Asp Phe Glu Thr Thr Ser Lys Arg Val Lys
                565                 570                 575
Arg Gln Val Gly Val Leu Gln Glu Thr Ala Lys Lys Glu Pro Glu Lys
            580                 585                 590
Glu Arg Asn Asp Lys Phe Asp Lys Tyr Leu Glu Asp Met Ser Glu Gly
        595                 600                 605
Lys Lys Phe Leu Lys Asp Ile Asp Asn Gln Asp Lys Phe Lys Asp Ile
    610                 615                 620
Leu Thr Asp Val Thr Val Thr Glu Thr Phe Glu Gly Gln Val Ala Ala
625                 630                 635                 640
Gly Ser Asp Ser Trp Ser Asn Ser His Gly Val Val Lys Tyr Gln Lys
                645                 650                 655
Asn Glu Asn Gly Gly Trp Phe Thr Thr Ser Lys Lys Glu Ser Leu Thr
            660                 665                 670
Trp Thr Ile Ser Lys Glu Gln Leu Lys Lys Ala Phe Glu Asp Gly Lys
        675                 680                 685

Pro Leu Thr Phe Thr Tyr Lys Leu Lys Val Glu Lys Asp Lys Phe Lys
    690                 695                 700
Thr Ala Leu Glu Glu Asn Lys Lys Gln Arg Thr Lys Arg Ser Ala Pro
705                 710                 715                 720
Thr Glu Asn Glu Asn Ser Val Thr Lys Lys Ile Ile Ser Asn Thr Val
                725                 730                 735
Thr Tyr Lys Ile Asn Asn Gln Glu Val Lys Asp Asn Asn Leu Asp Glu
            740                 745                 750
Val Asn Leu Thr Tyr Ser Lys Leu Lys Val Pro Val Pro Gln Ile Asp
        755                 760                 765
Gly Gln Val Ile Glu Pro Gln Ala Pro Lys Leu Pro Glu Leu Pro Pro
    770                 775                 780
Val Thr Glu Arg Gly Pro Val Leu Asp Tyr Thr Glu Glu Ser Ile Tyr
785                 790                 795                 800
Arg Leu Pro Leu Glu His Gly Ser Asn Ala Pro Asp Thr Gln Val Thr
                805                 810                 815
Ile Glu Glu Asp Thr Val Pro Gln Arg Pro Asp Ile Leu Val Gly Gly
            820                 825                 830
Gln Ser Gly Pro Val Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser
        835                 840                 845
Gly Ser Asn Asp Ala Thr Val Val Glu Glu Asp Thr Thr Pro Lys Arg
    850                 855                 860
Pro Asp Val Leu Val Gly Gly Gln Ser
865                 870

<210> 38
<211> 245
<212> PRT
<213> Streptococcus pyogenes

<400> 38
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Ala Ser Thr Thr Ser
 1               5                  10                  15
Ser Thr Glu Thr Ser Ala Thr Thr Ser Thr Ser Thr Gly Thr Ser Glu
            20                  25                  30
Thr Ala Ala Ser Glu Ala Gly Ser Gly Ala Ser Asp Val Ser Ile Ala
```

```
        35                  40                  45
Ser Ser Gly Gly Ser Gln Ser Ser Gly Thr Thr Pro Ser Ala Thr Thr
    50                  55                  60
Gly Thr Gly Glu Ala Ala Gly Ser Gly Thr Thr Val Ala Thr Ala Thr
65                  70                  75                  80
Thr Thr Asn Gly Gly Thr Gln Ser Thr Pro Ala Ala Ala Ser Ala Ser
                85                  90                  95
Ser Thr Ser Ser Thr Ser Ser Thr Ser Ser Ser Glu Asp Lys Ala Pro
            100                 105                 110
Lys Ala Ala Ser Thr Thr Leu Ser Ser Ala Thr Val Ala Ser Pro Ser
        115                 120                 125
Asn Gly Ser Asn Gln Glu Ala Ser Ala Glu Thr Ala Pro Gln Met Met
    130                 135                 140
Asp Val Glu Arg Tyr Glu Val Asp Asn Lys Glu Thr Glu Leu Lys Val
145                 150                 155                 160
Lys Asp Gly Lys Glu Thr Asn Gly Ser Gly Val Ser Lys Lys Leu Ile
                165                 170                 175
Arg Asn Arg Asp Asp Glu Gln Arg Gly Ile Val Asp Val Lys Arg Glu
            180                 185                 190
Val Lys Thr Asn Ser Asp Gly Thr Ile Asp Val Thr Val Thr Val Lys
        195                 200                 205
Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val
    210                 215                 220
Ser Lys Lys Met Thr Glu Glu Asp Phe Lys Asn Ala Lys Asp Lys Ile
225                 230                 235                 240
Lys Lys Leu Val Lys
                245
```

<210> 39
<211> 1029
<212> PRT
<213> Streptococcus pyogenes

<400> 39

```
Met Thr Asn Cys Lys Tyr Lys Leu Arg Lys Leu Ser Val Gly Leu Val
 1               5                  10                  15
Ser Val Gly Thr Met Leu Ile Ala Pro Thr Val Leu Gly Gln Glu Val
            20                  25                  30
Ser Thr Gly Val Ser Asn Thr Glu Ala Ser Ala Ser Ser Thr Asn Thr
        35                  40                  45
Asn Thr Ala Ser Ala Asp Ala Thr Ala Ser Gly Thr Ala Ala Thr Thr
    50                  55                  60
Pro Ser Ala Gly Thr Ser Thr Ser Thr Gly Glu Ala Ala Gly Ser Gly
65                  70                  75                  80
Leu Ser Ser Glu Ala Asn Trp Ser Asp Ala Ala Val Ala Ser Ser Gly
                85                  90                  95
Gly Ser Gln Ser Ser Gly Thr Thr Pro Ala Ser Pro Gln Ala Gln Thr
            100                 105                 110
Ala Pro Ala Ala Thr Thr Thr Thr Ser Ser Ala Ser Ser Ser Asn Glu
        115                 120                 125
Lys Pro Leu Lys Thr Ala Thr Thr Thr Thr Ser Ser Thr Pro Ala Ala
    130                 135                 140
Ser Ser Ser Ser Asn Gly Asn Gln Val Thr Gly Thr Glu Val Glu Pro
145                 150                 155                 160
Gln Met Met Asp Val Glu Gln Tyr Lys Val Asp Lys Glu Asn Ser Glu
                165                 170                 175
Leu Thr Val Lys Val Asp Arg Arg Gln Leu Lys Ile Arg Lys Asp Val
```

```
            180                 185                 190
Asp Asn Pro Lys Asp Lys Asp Leu Phe Asp Val Lys Arg Glu Val Lys
        195                 200                 205
Asp Asn Gly Gly Gly Thr Leu Asp Val Thr Leu Lys Val Met Pro Lys
    210                 215                 220
Gln Ile Asp Gly Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Lys
225                 230                 235                 240
Lys Met Thr Gln Glu Asn Phe Asp Lys Ala Lys Gly Gln Ile Lys Lys
                245                 250                 255
Val Val Thr Thr Leu Thr Gly Glu Ser Thr Asp Gly Lys Gly Asn Tyr
            260                 265                 270
Asn Arg Arg Asn Ser Val Arg Leu Met Thr Phe Tyr Arg Lys Val Ser
        275                 280                 285
Asp Pro Ile Glu Leu Thr Thr Lys Thr Ile Gly Ala Lys Leu Glu Glu
    290                 295                 300
Val Trp Glu Gln Ala Lys Lys Asp Trp Asp Trp Gly Val Asp Leu Gln
305                 310                 315                 320
Gly Ala Ile His Arg Ala Arg Asp Ile Phe Arg Gly Glu Lys Gly Ser
                325                 330                 335
Lys Gly Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe
            340                 345                 350
Ser Tyr Asp Ile Ser Asp Lys Asp Asn Gly Ala Ser Val Arg Val Pro
        355                 360                 365
Ser Ile Thr Gly Asn Val Thr Ala Ser Asn Pro Leu Phe Pro Trp Leu
    370                 375                 380
Pro Ile Phe Pro Pro Thr Pro His Pro Ala Glu Val Ile Asp Asp Val
385                 390                 395                 400
Asp Lys Leu Leu Gly Phe Ala Glu Asn Leu Gly Ile Ser Leu Pro Lys
                405                 410                 415
Gly Leu Arg Glu Gly Val Thr Ala Ile Gly Leu Arg Arg Gly Leu Leu
            420                 425                 430
Ser Ser Phe Thr Gly Ser Gly Leu Thr Glu Tyr Leu Thr Leu Ser Glu
        435                 440                 445
Tyr Gly Ser Ala Ile Leu Tyr Tyr Ala Gln Phe Asp Tyr Thr Thr Arg
    450                 455                 460
Val Gly Glu Gly Tyr Tyr Tyr His Ser Tyr Ser Val Arg Thr His Gly
465                 470                 475                 480
Asp Met Leu Pro Phe Glu Ser Glu Ile Arg Lys Ala Leu Glu Gln Val
                485                 490                 495
Leu Pro Lys Ile Glu Asp Arg Glu Trp Ala Pro Met Phe Ile Asp Ile
            500                 505                 510
Phe Gly Leu Pro Ile Gln Lys Val Asn Gln Ser Gly Ile Asp Val Ile
        515                 520                 525
Met Lys Val Ile Asn Ser Ile Phe Tyr Ser Arg Gln Tyr Phe Tyr Tyr
    530                 535                 540
Asn Arg Asn Leu Ser Ala Ile Ala Glu Ala Lys Met Ala Gln Glu Glu
545                 550                 555                 560
Gly Ile Thr Phe Tyr Ser Val Asp Val Thr Asp Leu Ser Ser Ala Ser
                565                 570                 575
Lys Arg Ala Lys Arg Gln Thr Ala Val Pro Gln Lys Thr Thr Lys Lys
            580                 585                 590
Glu Ser Glu Glu Asp Arg Asn Asn Lys Phe Asp Gly Tyr Leu Lys Lys
        595                 600                 605
Met Ser Glu Gly Gly Lys Glu Phe Phe Thr Gly Val Asp Lys Ala Asp
    610                 615                 620
Lys Phe Lys Asp Thr Leu Thr Glu Leu Thr Ile Lys Asp Glu Phe Glu
625                 630                 635                 640
```

```
Asp Lys Val Thr Val Glu Thr Asn Ser Glu Gly Lys Lys Asn Tyr Lys
                645                 650                 655
Thr Asn Leu Lys Gly Asn Thr Leu Lys Val Asn His Thr Pro Ser Lys
            660                 665                 670
Ala Gly Ser Leu Ser Trp Phe Ser Ser Ala Thr Lys Glu Ser Leu Thr
        675                 680                 685
Trp Thr Ile Ser Lys Asp Leu Gly Arg Lys Lys Ala Phe Glu Asp Gly
    690                 695                 700
Lys Pro Leu Thr Leu Thr Tyr Lys Leu Lys Val Asp Asn Gly Lys Phe
705                 710                 715                 720
Lys Lys Ser Leu Glu Glu Asn Asn Lys Lys Arg Thr Lys Arg Ser Ala
                725                 730                 735
Pro Thr Glu Asn Glu Asn Ser Ile Lys Glu Lys Ile Ile Ser Asn Thr
            740                 745                 750
Ile Thr Tyr Lys Ile Asn Asn Gln Lys Gly Gln Thr Gly Lys Lys Leu
        755                 760                 765
Asp Asp Val Ser Leu Thr Tyr Ser Lys Leu Lys Val Pro Val Pro Gln
    770                 775                 780
Ile Asp Glu Lys Val Ile Glu Gln Gln Glu Pro Thr Leu Pro Lys Leu
785                 790                 795                 800
Pro Pro Val Ile Glu His Gly Pro Asn Phe Glu Tyr Glu Glu Glu Thr
            .   805                 810                 815
Gly Tyr Gln Leu Pro Leu Lys His Gly Arg Asn Ala Pro Asp Thr Gln
            820                 825                 830
Val Thr Ile Glu Glu Asp Thr Val Pro Gln Arg Pro Asp Ile Leu Val
        835                 840                 845
Gly Gly Gln Ser Asp Pro Ile Asp Ile Thr Glu Asp Thr Gln Pro Gly
    850                 855                 860
Met Ser Gly Ser Asn Asp Ala Thr Val Val Glu Glu Asp Thr Ala Pro
865                 870                 875                 880
Lys Arg Pro Asp Val Leu Val Gly Gly Gln Ser Glu Pro Ile Asp Ile
                885                 890                 895
Thr Glu Asp Thr Gln Pro Ser Val Ser Gly Ser Asn Asp Ala Thr Val
            900                 905                 910
Val Glu Glu Asp Thr Val Pro Lys Arg Pro Asp Ile Leu Val Gly Gly
        915                 920                 925
Gln Ser Asp Gln Ile Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser
    930                 935                 940
Gly Ser Asn Asp Ala Thr Val Ile Glu Glu Asp Thr Lys Pro Lys Arg
945                 950                 955                 960
Phe Phe His Phe Asp Asn Glu Pro Gln Ala Pro Leu Lys Pro Tyr Glu
                965                 970                 975
Gln Pro Ser Leu Ser Leu Pro Gln Ala Pro Val Tyr Lys Ala Ala His
            980                 985                 990
His Leu Pro Ala Ser Gly Asp Lys Arg Glu Ala Thr Ile Thr Ile Val
        995                 1000                1005
Ala Leu Thr Leu Ile Gly Ala Ala Gly Leu Leu Ser Lys Lys Arg Arg
    1010                1015                1020
Asp Thr Glu Glu Asn
1025
```

<210> 40
<211> 258
<212> PRT

<213> Streptococcus pyogenes

<400> 40
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Gly Ala Ser Ser
 1   5   10   15
Ser Thr Glu Thr Ser Ala Ser Ser Asn Asn Thr Asn Thr Ala Ser Thr
            20   25   30
Val Glu Thr Ser Thr Thr Thr Ser Thr Ser Gly Thr Ala Ala Ser Gly
        35   40   45
Thr Gly Ser Glu Ala Ala Val Ala Ser Ser Gly Gly Ser Gln Ser Ser
    50   55   60
Gly Thr Thr Pro Ala Ser Pro Gln Ala Gln Thr Ser Glu Gln Pro Ala
65   70   75   80
Val Thr Ser Ala Ser Ser Thr Ser Ser Ser Ser Glu Glu Lys Thr Pro
                85   90   95
Lys Ala Ala Asn Thr Ala Ser Ser Ser Ala Thr Val Ala Ser Pro Ser
            100   105   110
Asn Gly Ser Asn Gln Glu Ala Ser Ala Glu Thr Glu Pro Gln Thr Met
        115   120   125
Glu Val Glu Lys Tyr Thr Val Asp Arg Glu Asn Ser Glu Leu Lys Val
    130   135   140
Lys Asp Gly Thr Gln Pro Lys Lys Gly Arg Ser Val Ser Gln Asp Thr
145   150   155   160
Lys Leu Ile Lys Asn Arg Asp Gly Lys Gln Arg Asp Ile Val Asp Val
                165   170   175
Thr Arg Thr Val Lys Thr Asn Glu Asp Gly Thr Ile Asp Val Thr Val
            180   185   190
Thr Val Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met Ala Leu
        195   200   205
Leu Asp Val Ser Lys Lys Met Thr Glu Asp Asp Phe Lys Asn Ala Lys
    210   215   220
Glu Lys Ile Lys Lys Leu Val Thr Thr Leu Thr Ser Lys Ser Pro Asp
225   230   235   240
Gly Gln Pro Asn His Asn Ala Arg Asn Ser Val Arg Leu Met Thr Phe
                245   250   255
Tyr His

<210> 41
<211> 216
<212> PRT
<213> Streptococcus pyogenes

<400> 41
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Thr Ser Thr Ala
 1   5   10   15
Ser Thr Glu Thr Ser Ala Ser Ser Thr Ala Ser Ala Ser Thr Asp Thr
            20   25   30
Ala Thr Thr Ser Val Thr Ala Ala Thr Thr Pro Ser Thr Thr Thr Gly
        35   40   45
Thr Ser Val Thr Ala Ala Asn Gly Thr Ser Ser Gly Thr Thr Val Ala
    50   55   60
Thr Ala Thr Thr Thr Asn Gly Gly Thr Gln Ser Thr Pro Ala Ala Ala
65   70   75   80
Glu Thr Thr Pro Lys Pro Gln Ala Gln Thr Ala Val Ala Thr Ser Ser
                85   90   95
Ser Ser Ser Asn Ala Asn Pro Leu Ser Glu Thr Gln Ala Ser Lys Ala
            100   105   110
Ala Ser Thr Thr Ser Ser Ser Ala Thr Val Ala Ser Ser Ser Asn Gly

```
        115                 120                 125
Ser Asn Gln Gly Ala Gly Thr Glu Ala Glu Pro Gln Met Met Asp Val
    130                 135                 140
Glu Lys Tyr Thr Val Asp Lys Glu Asn Ser Glu Leu Lys Val Lys Asp
145                 150                 155                 160
Gly Lys Glu Thr Asn Gly Ser Gly Val Asn Lys Lys Leu Ile Arg Asn
                165                 170                 175
Arg Asp Gly Glu Gln Arg Asp Ile Phe Asp Ile Lys Arg Glu Val Lys
            180                 185                 190
Thr Asn Ser Asp Gly Thr Ile Asp Val Thr Val Thr Val Thr Pro Lys
        195                 200                 205
Glu Ile Asp Glu Gly Ala Asp Val
    210                 215
```

<210> 42
<211> 235
<212> PRT
<213> Streptococcus pyogenes

<400> 42

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Ala Ser Thr Thr Ser
 1               5                  10                  15
Thr Glu Thr Ser Ala Thr Ser Thr Asn Thr Ser Thr Ala Ser Ala Gly
            20                  25                  30
Thr Ser Thr Ser Gly Thr Ala Thr Thr Thr Ser Ser Ala Thr Thr Asp
        35                  40                  45
Ala Gly Arg Ala Ala Gly Ser Gly Thr Ala Ser Gly Thr Asn Gly Val
    50                  55                  60
Ser Ser Val Ala Ser Ser Glu Gly Ser Gln Gly Ser Glu Pro Gly Gln
65                  70                  75                  80
Ala Ser Thr Gln Pro Gln Ala Gln Thr Leu Glu Gln Ser Ala Ala Thr
                85                  90                  95
Ser Thr Ser Ser Ala Ser Ser Ser Asn Glu Glu Lys Ser Ile Lys Ser
            100                 105                 110
Ala Thr Ser Ser Thr Pro Ser Thr Ala Ala Ala Ser Ser Ser Ser Asn
        115                 120                 125
Gly Asn Gln Glu Ala Ser Ala Gly Thr Ala Pro Gln Met Met Glu Val
    130                 135                 140
Glu Arg Tyr Thr Val Asp Lys Glu Asn Ser Glu Leu Lys Val Lys Asp
145                 150                 155                 160
Gly Asp Lys Leu Lys Asn Gly Gly Ser Ala Thr Lys Glu Thr Lys Leu
                165                 170                 175
Ile Arg Asn Arg Asp Gly Lys Gln Arg Asp Ile Val Asp Val Thr Arg
            180                 185                 190
Thr Val Lys Thr Asn Glu Asp Gly Thr Ile Asp Val Thr Val Thr Val
        195                 200                 205
Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met Ala Leu Leu Asp
    210                 215                 220
Val Ser Gln Lys Met Thr Lys Glu Asn Phe Asp
225                 230                 235
```

<210> 43
<211> 865
<212> PRT
<213> Streptococcus pyogenes

<400> 43

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Asn Ala Ser Thr Thr Ser
 1               5                  10                  15
Ser Thr Glu Thr Ser Ala Ser Ser Ala Ala Ser Val Ser Ala Gly Thr
            20                  25                  30
Gly Thr Ser Gly Thr Ala Ala Arg Glu Ala Gly Ser Gly Ala Ser Asp
        35                  40                  45
Glu Ser Ser Asp Ala Ser Val Ala Ser Ser Glu Gly Ser Gln Gly Ser
    50                  55                  60
Lys Phe Ala Pro Ala Ser Pro Gln Pro Gln Ala Gln Thr Ala Thr Val
65                  70                  75                  80
Ala Ser Ala Ser Thr Thr Ala Ser Pro Ser Ser Ser Ser Ala Ser Asp
                85                  90                  95
Gly Lys Ala Pro Gln Ala Ala Ser Thr Lys Ser Ser Ser Ala Thr Val
            100                 105                 110
Ala Ser Ser Ser Asn Gly Ser Asn Gln Gly Ala Gly Ala Glu Asp Ala
        115                 120                 125
Pro Gln Met Met Asp Val Glu Gln Tyr Thr Val Asp Lys Glu Ser Ser
    130                 135                 140
Glu Leu Lys Val Lys Asp Gly Lys Asn Pro Lys Asn Gly Ser Arg Ala
145                 150                 155                 160
Asp Lys Asn Thr Lys Leu Ile Arg Asn Arg Asp Asp Glu Gln Arg Asp
                165                 170                 175
Ile Phe Asp Ile Lys Arg Glu Val Lys Asp Asn Gly Asp Gly Thr Leu
            180                 185                 190
Asp Val Thr Leu Lys Val Thr Pro Lys Glu Ile Asp Glu Gly Ala Asp
        195                 200                 205
Val Met Ala Leu Leu Asp Val Ser Gln Lys Met Thr Asp Ala Asp Phe
    210                 215                 220
Lys Asn Ala Lys Asp Lys Ile Lys Lys Leu Val Thr Thr Leu Thr Ser
225                 230                 235                 240
Lys Ser Asn Ser Asp Glu His Lys His Asn Ser Arg Asn Ser Val Arg
                245                 250                 255
Leu Met Thr Phe Tyr Arg Glu Ile Ser Asp Pro Ile Asp Ile Ser Gly
            260                 265                 270
Lys Thr Glu Ala Glu Leu Asp Gln Leu Leu Asn Glu Leu Arg Glu Lys
        275                 280                 285
Ala Lys Ala Asn Tyr Asp Trp Gly Val Asp Leu Gln Gly Ala Ile His
    290                 295                 300
Lys Thr Arg Glu Ile Phe Asn Lys Glu Gln Lys Ser Lys Lys Arg Gln
305                 310                 315                 320
His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe Ser Tyr Asp Ile
                325                 330                 335
Gln Lys Ser Glu Lys Glu Lys Asp Ser Asn Leu Ser Arg Ile Asn Glu
            340                 345                 350
Lys Ile Thr Ser Ser Asn Pro Leu Leu Pro Trp Pro Pro Ile Phe Asp
        355                 360                 365
His Thr His Gln Asn Ala Asp Met Leu Lys Asp Val Glu Phe Leu Ile
    370                 375                 380
Ser Leu Ala Gln Lys Leu Gly Val Thr Gly Leu Ser Ser Ile Lys Thr
385                 390                 395                 400
Ile Leu Gln Gly Val Gly Leu Ala Asn Gln Phe Gly Gly Leu Leu Leu
                405                 410                 415
Gly Gly Gly Ser Leu Thr Glu Tyr Leu Thr Leu Gln Glu Tyr Lys Thr
            420                 425                 430
Asn Thr Phe Thr Lys Glu Gln Phe Asp Tyr Thr Lys Arg Val Gly Glu
        435                 440                 445
Gly Tyr His Tyr His Ser Phe Ser Thr Arg Lys Ser Glu Asp Lys Ile
```

```
    450                 455                 460
Pro Phe Glu Lys Asp Ile Glu Ala Ala Leu Lys Thr Ala Leu Pro Glu
465                 470                 475                 480
Ser Lys Ser Glu Asn Trp Phe Thr Lys Val Leu Thr Tyr Phe Gly Leu
                485                 490                 495
Lys Asn Lys Ala Glu Gln Ala Lys Leu Asp Val Ile Met Lys Val Ile
            500                 505                 510
Lys Ser Val Phe Tyr Lys Arg Gln Tyr His Tyr Tyr Asn His Asn Leu
        515                 520                 525
Ser Ala Ile Ala Glu Ala Lys Met Ala Gln Lys Asp Gly Ile Thr Phe
    530                 535                 540
Tyr Ser Val Asp Val Thr Asp Ser Asp Asn Ala Ser Lys Arg Val Lys
545                 550                 555                 560
Arg Gln Val Gly Lys Glu Gln Ser Lys Lys Lys Lys Glu Asp Ala Gly
                565                 570                 575
Lys Asp Arg Ser Lys Lys Phe Asp Asp Tyr Leu Lys Lys Met Ser Glu
            580                 585                 590
Gly Asp Asn Phe Leu Ser Asn Val Glu Glu Arg Asp Lys Phe Lys Asp
        595                 600                 605
Thr Leu Thr Glu Leu Thr Val Lys Asp Glu Phe Ser Asp Lys Val Thr
    610                 615                 620
Val Gln Asn Asn Ser Glu Gly Lys Lys Tyr Gln Val Thr Gly Leu Ile
625                 630                 635                 640
Asn Asp Ile Lys Val Ser Tyr Thr Ala Ala Asn Asn Thr Gly Trp Phe
                645                 650                 655
Thr Arg Thr Lys Glu Ser Leu Thr Trp Thr Ile Ser Lys Glu Gln Leu
            660                 665                 670
Lys Lys Ala Phe Glu Asp Gly Lys Pro Leu Thr Leu Thr Tyr Lys Leu
        675                 680                 685
Lys Val Asp Asn Asp Lys Leu Lys Lys Ala Leu Asp Asp Lys Arg Lys
    690                 695                 700
Asp Arg Lys Lys Arg Asp Thr Ser Thr Lys Asn Glu Asn Ser Val Thr
705                 710                 715                 720
Glu Arg Ile Ile Ser Asn Ile Thr Thr Tyr Lys Ile Asn Gly Gln Glu
                725                 730                 735
Val Lys Asp Asn Asn Leu Ser Asp Val Ser Leu Thr Tyr Ser Lys Leu
            740                 745                 750
Lys Val Pro Val Pro Gln Ile Asp Gly His Val Ile Glu Pro Gln Ala
        755                 760                 765
Pro Thr Leu Pro Lys Leu Pro Pro Val Thr Glu Arg Gly Pro Val Leu
    770                 775                 780
Asp Tyr Thr Glu Glu Ser Ile Tyr Arg Leu Pro Leu Glu His Gly Ser
785                 790                 795                 800
Asn Ala Pro Asp Thr Gln Val Thr Ile Glu Glu Asp Thr Val Pro Gln
                805                 810                 815
Arg Pro Asp Ile Leu Val Gly Gly Gln Ser Gly Pro Val Asp Ile Thr
            820                 825                 830
Glu Asp Thr Gln Pro Gly Met Ser Gly Ser Asn Asp Ala Thr Val Val
        835                 840                 845
Glu Glu Asp Thr Ala Pro Gln Arg Pro Asp Val Leu Val Gly Gly Gln
    850                 855                 860
Ser
865
```

<210> 44
<211> 214
<212> PRT

<213> Streptococcus pyogenes

<400> 44
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Ala Gly Ala Ser Ser
 1   5   10   15
Ser Thr Glu Thr Ser Ala Ala Ser Ala Ser Ala Gly Thr Ser Thr Ser
            20   25   30
Glu Thr Ala Ala Ser Gly Thr Gly Ser Glu Ala Ala Val Val Ser Ser
        35   40   45
Glu Gly Ser Gln Ser Ser Glu Ser Ala Gln Ala Ser Pro Gln Pro Gln
    50   55   60
Pro Gln Ala Gln Thr Val Thr Ala Thr Thr Ser Thr Ser Ser Thr Ser
65   70   75   80
Ser Ser Ser Asp Gly Lys Ser Thr Lys Ser Ala Thr Ser Ser Thr Ser
                85   90   95
Ser Ala Phe Ser Thr Ser Ser Ser Glu Asp Lys Ala Pro Lys Ala Ala
            100   105   110
Ser Thr Lys Ser Ser Ser Thr Thr Val Ala Ser Pro Ser Asn Gly Ser
        115   120   125
Asn Gln Gly Ala Ser Thr Glu Thr Glu Pro Gln Met Met Glu Val Glu
    130   135   140
Gln Tyr Lys Val Asp Lys Glu Glu Thr Glu Leu Lys Val Lys Asp Gly
145   150   155   160
Ser Lys Leu Asn Ser Ser Ser Asp Lys Lys Leu Ile Arg Asn Arg Asp
                165   170   175
Gly Glu Gln Arg Asp Ile Phe Asp Ile Lys Arg Glu Val Lys Thr Asn
            180   185   190
Ser Asp Gly Thr Ile Asp Val Thr Val Thr Val Thr Pro Lys Glu Ile
        195   200   205
Asp Glu Gly Ala Asp Val
    210

<210> 45
<211> 1013
<212> PRT
<213> Streptococcus pyogenes

<400> 45
Met Thr Asn Cys Lys Tyr Lys Leu Arg Lys Leu Ser Val Gly Leu Val
 1   5   10   15
Ser Val Gly Thr Met Leu Ile Ala Pro Thr Val Leu Gly Gln Glu Val
            20   25   30
Ser Thr Thr Gly Ser Thr Glu Thr Ser Ala Ala Ser Thr Thr Thr Ser
        35   40   45
Thr Ala Ser Thr Val Glu Thr Ser Thr Thr Thr Gly Thr Ser Val Thr
    50   55   60
Ala Ala Ser Glu Ala Ser Ser Glu Ser Ser Asp Val Ser Val Val Ser
65   70   75   80
Ser Glu Gly Ser Gln Ser Ser Ala Ser Ala Pro Ala Ser Pro Gln Pro
                85   90   95
Gln Ala Gln Thr Pro Pro Ala Ala Thr Ser Thr Ser Ser Ala Ser Ser
            100   105   110
Ser Ser Ser Glu Asp Lys Ala Ser Lys Ala Ala Thr Ser Ser Thr Ser
        115   120   125
Ser Ser Thr Pro Ala Val Ala Ser Ser Ser Ser Asn Ser Asn Gln Ala
    130   135   140
Thr Gly Thr Glu Val Glu Pro Gln Met Met Glu Val Glu Gln Tyr Thr

```
145                 150                 155                 160
Val Asn Lys Glu Ser Ser Glu Leu Lys Val Lys Asp Gly Lys Glu Met
                165                 170                 175
Asn Gly Ser Gly Val Ser Lys Lys Leu Ile Arg Asn Arg Asp Gly Glu
            180                 185                 190
Gln Arg Asp Ile Phe Asp Ile Lys Arg Glu Val Lys Thr Asn Ala Asp
        195                 200                 205
Gly Thr Ile Asp Val Thr Val Thr Val Thr Pro Lys Glu Ile Asp Lys
    210                 215                 220
Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Ser Lys
225                 230                 235                 240
Glu Asp Phe Asn Asn Ala Lys Thr Lys Ile Lys Gln Leu Val Lys Thr
                245                 250                 255
Leu Thr Glu Lys Asn Gly Glu Asn His Asn Ser Arg Asn Ser Val Arg
            260                 265                 270
Leu Met Thr Phe Tyr Arg Glu Ile Ser Asp Pro Ile Asp Ile Ser Gly
        275                 280                 285
Lys Thr Glu Glu Gln Leu Asp Lys Ile Leu Asn Asp Leu Arg Lys Lys
    290                 295                 300
Ala Lys Ala Asn Tyr Asp Trp Gly Val Asp Leu Gln Gly Ala Ile His
305                 310                 315                 320
Lys Ala Arg Glu Ile Phe Lys Arg Asp Gln Glu Lys Lys Ser Gly Lys
                325                 330                 335
Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe Ser Tyr
            340                 345                 350
Asp Ile Lys Asn Lys Asn Asp Ser Thr Val Thr Lys Thr Arg Ile Thr
        355                 360                 365
Glu Lys Val Thr Thr Ser Asn Pro Leu Leu Pro Trp Pro Pro Ile Phe
    370                 375                 380
Asp His Thr His Gln Asn Ala Asp Met Leu Glu Asp Ser Ala Lys Leu
385                 390                 395                 400
Ile Lys Lys Leu Lys Ser Leu Gly Leu Glu Ser Leu Gln Thr Ala Asp
                405                 410                 415
Asn Ile Leu Gln Ala Leu Gln Ala Ala Asn Arg Ile Gly Ser Leu Phe
            420                 425                 430
Gly Lys Ser Pro Thr Glu Tyr Leu Thr Leu Asn Glu Tyr Asp Ser Asn
        435                 440                 445
Lys Leu Gly Glu Glu Ser Phe Asp Tyr Ser Lys His Val Gly Glu Gly
    450                 455                 460
Tyr Tyr Tyr His Ser Phe Ser Asp Arg Lys Ser Glu Asn Thr Met Pro
465                 470                 475                 480
Leu Glu Ser Ala Ile Lys Thr Ala Leu Thr Ser Asn Phe Pro Lys Ile
                485                 490                 495
Pro Asp Ser Trp Phe Phe Gly Ile Leu Lys Ser Ser Asp Ile Lys Ala
            500                 505                 510

Lys Val Glu Lys Ala Lys Leu Asp Val Ile Met Gln Val Leu Lys Ser
        515                 520                 525
Ile Phe Tyr Lys Arg Glu Tyr Arg Tyr Tyr Asn His Asn Leu Ser Ala
    530                 535                 540
Ile Ala Glu Ala Lys Met Ala Gln Lys Asp Gly Ile Thr Phe Tyr Ser
545                 550                 555                 560
Val Asp Val Thr Ser Pro Asn Gln Pro Ala Thr Thr Lys Arg Ser Arg
                565                 570                 575
Arg Ser Thr Glu Lys Lys Glu Ala Glu Glu Arg Asn Glu Lys Phe Asp
            580                 585                 590
Lys Tyr Leu Lys Glu Met Ser Glu Gly Gly Lys Lys Phe Phe Asn Asp
```

595 600 605
Val Asp Lys Thr Asp Lys Phe Lys Asp Thr Leu Thr Glu Leu Lys Ile
610 615 620
Lys Asp Glu Phe Thr Asp Lys Val Thr Val Glu Glu Asn Ser Trp Asn
625 630 635 640
Thr Leu Ser Thr Ala Gly Leu Lys Asn Ser Asn Lys Asn Lys Asp Val
645 650 655
Gln His Gln Lys Ala Ser Gln Pro Ser Val Trp Ser Phe Thr Ser Pro
660 665 670
Ser Lys Glu Ser Leu Thr Trp Thr Ile Ser Lys Glu Gln Leu Lys Glu
675 680 685
Ala Phe Glu Lys Asn Gly Ser Leu Thr Phe Lys Tyr Lys Leu Arg Val
690 695 700
Asn Lys Asp Lys Leu Leu Asp Lys Asn Lys Asn Ile Thr Lys Arg Asp
705 710 715 720
Thr Ser Thr Glu Asp Lys Thr Ser Val Thr Ala Asn Ile Ile Ser Asn
725 730 735
Thr Ile Thr Tyr Lys Ile Asn Asp Gln Glu Val Lys Gly Asn Asn Leu
740 745 750
Asp Asp Val Asn Leu Thr Tyr Ser Lys Phe Lys Val Pro Val Pro Gln
755 760 765
Ile Asp Gly His Val Ile Glu Pro Gln Ala Pro Thr Leu Pro Lys Leu
770 775 780
Pro Pro Val Ile Glu His Gly Pro Asn Phe Glu Tyr Glu Glu Glu Thr
785 790 795 800
Gly Tyr Gln Leu Pro Leu Lys His Gly Ser Asn Ala Pro Asp Thr Gln
805 810 815
Val Thr Ile Glu Glu Asp Thr Val Pro Gln Arg Pro Asp Ile Leu Val
820 825 830
Gly Gly Gln Ser Gly Pro Val Asp Ile Thr Glu Asp Thr Gln Pro Gly
835 840 845
Met Ser Gly Ser Asn Asp Ala Thr Val Val Glu Glu Asp Thr Ala Pro
850 855 860
Gln Arg Pro Asp Val His Val Gly Gly Gln Ser Asp Pro Ile Asp Ile
865 870 875 880
Thr Glu Asp Thr Gln Pro Gly Met Ser Gly Ser Asn Asp Ala Thr Val
885 890 895
Val Glu Glu Asp Thr Val Pro Lys Arg Pro Asp Val His Val Gly Gly
900 905 910
Gln Ser Asp Pro Ile Asp Ile Thr Glu Asp Thr Gln Pro Gly Met Ser
915 920 925
Gly Ser Asn Asp Ala Thr Val Ile Glu Glu Asp Thr Lys Pro Lys Arg
930 935 940
Phe Phe His Phe Glu Asn Glu Pro Gln Ala Pro Glu Lys Pro Lys Glu
945 950 955 960
Gln Pro Ser Leu Ser Leu Pro Gln Ala Pro Val Tyr Lys Ala Ala His
965 970 975
His Leu Pro Ala Ser Gly Asp Lys Arg Glu Ala Ser Phe Thr Ile Val
980 985 990
Ala Leu Thr Ile Ile Gly Ala Ala Gly Leu Leu Ser Lys Lys Arg Arg
995 1000 1005
Asp Thr Glu Glu Asn
1010

<210> 46
<211> 202
<212> PRT

<213> Streptococcus pyogenes

<400> 46
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Gly Ala Ser Ser
 1   5   10   15
Thr Glu Thr Ser Ala Ser Ser Asn Asn Thr Asn Thr Asn Thr Ala Ser
            20   25   30
Thr Val Glu Thr Ser Thr Thr Thr Ser Thr Ser Gly Thr Ala Ala Ser
        35   40   45
Gly Thr Gly Ser Glu Ala Ala Val Ala Ser Ser Gly Gly Ser Gln Ser
    50   55   60

Ser Gly Thr Thr Pro Ala Ser Pro Gln Ala Gln Thr Ser Glu Gln Pro
65   70   75   80
Ala Val Thr Ser Ala Ser Ser Thr Ser Ser Ser Ser Glu Glu Lys Thr
                85   90   95
Pro Gln Ala Ala Asn Thr Ala Ser Ser Ser Ala Thr Val Ala Ser Pro
            100   105   110
Ser Asn Gly Ser Asn Gln Glu Ala Ser Ala Glu Thr Glu Pro Gln Met
        115   120   125
Met Glu Val Glu Gln Tyr Lys Val Asp Lys Glu Glu Thr Glu Leu Lys
    130   135   140
Val Lys Asp Gly Asn Lys Leu Asn Asn Ser Ser Asp Lys Lys Leu Ile
145   150   155   160
Arg Asn Arg Asp Gly Glu Gln Arg Asp Ile Phe Asp Ile Lys Arg Glu
                165   170   175
Val Lys Thr Asn Ser Asp Gly Thr Ile Asp Val Thr Val Thr Val Thr
            180   185   190
Pro Lys Glu Ile Asp Glu Gly Ala Asp Val
        195   200

<210> 47
<211> 256
<212> PRT
<213> Streptococcus pyogenes

<400> 47
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Asn Ala Ser Thr Glu Thr
 1   5   10   15
Ser Thr Thr Ser Thr Ser Thr Ala Ser Val Asp Ala Thr Thr Ser Gly
            20   25   30
Thr Ala Ala Thr Thr Pro Ser Ala Gly Thr Ser Thr Ser Thr Gly Glu
        35   40   45
Ala Ala Gly Ser Gly Ala Ser Ser Glu Ala Asn Gly Ala Ser Ser Val
    50   55   60
Val Ser Ser Glu Glu Ser Gln Ser Ser Gly Thr Thr Pro Ala Ser Pro
65   70   75   80
Gln Ala Gln Thr Ala Pro Ala Ala Thr Ser Thr Ser Ser Ala Ser Ser
                85   90   95
Ser Asn Glu Lys Thr Pro Lys Thr Ala Thr Thr Thr Thr Ser Thr Ser
            100   105   110
Ser Thr Pro Val Ala Ser Thr Ser Asn Asn Ser Asn Lys Val Thr Ser
        115   120   125
Thr Glu Ala Glu Thr Pro Met Met Asp Val Glu Gln Tyr Thr Val Asp
    130   135   140
Lys Lys Asp Ser Ser Val Thr Gln Thr Asp Asp Lys Lys Leu Leu Lys
145   150   155   160

```
Ile Arg Arg Asp Gly Asp Glu Lys Thr Arg Asp Leu Tyr Asp Val Lys
                165                 170                 175
Arg Glu Val Lys Asp Asn Gly Asp Gly Thr Leu Asp Val Thr Leu Lys
            180                 185                 190
Val Thr Pro Lys Gln Ile Asp Glu Gly Ala Asp Val Met Ala Leu Leu
        195                 200                 205
Asp Val Ser Lys Lys Met Thr Glu Thr Asp Phe Lys Asn Ala Lys Glu
    210                 215                 220
Lys Ile Lys Lys Leu Val Thr Thr Leu Thr Ser Lys Ser Thr Asp Asn
225                 230                 235                 240
Gln Pro Asn His Asn Ala Arg Asn Ser Val Arg Leu Met Thr Phe Tyr
                245                 250                 255

<210> 48
<211> 208
<212> PRT
<213> Streptococcus pyogenes

<400> 48
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Thr Gly Thr Ala Ser
 1               5                  10                  15
Thr Glu Thr Ser Ala Ser Ser Thr Asn Ser Asn Asn Thr Ala Ser Ala
            20                  25                  30
Asp Ala Thr Ala Ser Gly Thr Ala Ala Ser Gly Thr Ala Ser Gly Thr
        35                  40                  45
Asn Gly Ala Phe Ser Val Thr Ser Ser Glu Gly Ser Gln Ser Ser Glu
    50                  55                  60
Ser Ala Pro Ala Ser Lys Gln Pro Gln Ala Val Val Ser Thr Ala Ala
65                  70                  75                  80
Thr Ser Ala Ser Thr Ala Ser Ser Ser Ser Ser Glu Glu Lys Thr Pro
                85                  90                  95
Lys Ala Ala Thr Ala Ser Thr Thr Ala Ser Ser Thr Pro Ala Thr Ser
            100                 105                 110
Ser Ser Asn Asp Gly Asn Asn Gln Gly Ala Ser Thr Glu Val Glu Thr
        115                 120                 125
Pro Met Met Glu Val Glu Gln Tyr Lys Val Asn Lys Glu Lys Thr Glu
    130                 135                 140
Leu Thr Val Lys Asp Gly Thr Gln Pro Lys Asn Gly Lys Thr Ala Asn
145                 150                 155                 160
Gln Asn Thr Lys Leu Ile Arg Asn Arg Asp Gly Glu Gln Arg Asp Ile
                165                 170                 175
Phe Asp Ile Lys Arg Glu Val Lys Thr Asn Ala Asp Gly Thr Ile Asp
            180                 185                 190
Val Thr Val Thr Val Thr Pro Lys Glu Ile Asp Glu Gly Ala Asp Val
        195                 200                 205

<210> 49
<211> 221
<212> PRT
<213> Streptococcus pyogenes

<400> 49
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Asn Ala Ser Thr Glu Thr
 1               5                  10                  15
Ser Ala Ser Ser Thr Thr Ser Thr Ala Ser Thr Ala Glu Thr Ser Thr
            20                  25                  30
Pro Thr Gly Thr Ser Gly Thr Ala Ala Ser Gly Ala Ser Gly Glu Ala
```

```
        35                  40                  45
Thr Val Ala Thr Ala Asn Gly Gly Pro Gln Ser Ala Pro Ala Thr Ser
    50                  55                  60
Glu Ala Thr Pro Gln Pro Gln Ala Gln Ala Ala Pro Ala Ala Ser Ala
65                  70                  75                  80
Pro Thr Thr Val Thr Ser Ser Ser Ser Ser Asp Ser Asp Ala Lys Thr
                85                  90                  95
Pro Lys Ala Ala Ser Thr Thr Ser Ser Ser Ala Thr Val Ala Ser Pro
            100                 105                 110
Ser Asn Gly Ser Asn Lys Glu Ala Asn Ala Glu Thr Ala Pro Gln Met
        115                 120                 125
Met Asp Val Glu Gln Tyr Lys Ile Lys Asp Glu Asn Ser Ser Ile Thr
    130                 135                 140
Val Ala Asp Lys Ala Lys Gln Leu Lys Ile Arg Arg Asp Asp Asn Pro
145                 150                 155                 160
Lys Asp Lys Asp Leu Phe Asp Val Lys Arg Glu Val Lys Asp Asn Gly
                165                 170                 175
Asp Gly Thr Leu Asp Val Thr Leu Lys Val Met Pro Lys Gln Ile Asp
            180                 185                 190
Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Gln Lys Met Thr
        195                 200                 205
Lys Glu Asn Phe Asp Lys Ala Lys Glu Gln Ile Lys Lys
    210                 215                 220
```

<210> 50
<211> 197
<212> PRT
<213> Streptococcus pyogenes

<400> 50

```
Ile Ala Pro Thr Ala Leu Gly Gln Glu Val Ser Thr Asn Thr Asn Thr
 1               5                  10                  15
Ser Thr Ala Ser Ala Gly Thr Thr Ala Asn Gly Thr Ala Asp Thr Ile
            20                  25                  30
Pro Asn Ala Thr Thr Asp Ala Gly Gly Ala Ala Gly Ser Gly Thr Asn
        35                  40                  45
Gly Ala Ser Ser Val Thr Ser Ser Gly Gly Ser Gln Ser Ser Glu Ser
    50                  55                  60
Ala Gln Ala Ser Pro Gln Ala Gln Thr Ala Thr Val Ala Ser Ala Ser
65                  70                  75                  80
Thr Thr Ala Ser Pro Ser Ser Ala Ser Ala Ser Asp Val Lys Ala Pro
                85                  90                  95
Arg Ala Ala Thr Ser Ser Thr Pro Ser Thr Pro Ala Ala Ser Thr Ser
            100                 105                 110
Ser Asn Ser Asn Gln Val Thr Gly Thr Glu Ala Glu Pro Gln Met Met
        115                 120                 125
Asp Val Glu Gln Tyr Thr Val Asp Lys Lys Asp Ser Ser Val Thr Gln
    130                 135                 140
Thr Asp Asn Lys Lys Leu Leu Lys Ile Arg Arg Asp Gly Lys Glu Lys
145                 150                 155                 160
Glu Asp Arg Thr Leu Tyr Asp Ile Lys Arg Glu Val Lys Asp Asn Gly
                165                 170                 175
Asp Gly Thr Leu Asp Val Thr Leu Lys Val Thr Pro Lys Gln Ile Asp
            180                 185                 190
Glu Gly Ala Asp Val
        195
```

<210> 51
<211> 447
<212> PRT
<213> Streptococcus pyogenes

<400> 51
Ile Ala Pro Thr Ile Leu Gly Gln Glu Val Ser Ala Ser Thr Glu Thr
1 5 10 15
Ser Thr Thr Ser Thr Ser Thr Ala Ser Val Asp Ala Thr Thr Ser Gly
20 25 30
Thr Ala Ala Thr Thr Pro Ser Ala Ser Thr Ser Thr Gly Gly Thr Ala
35 40 45
Ala Ser Gly Ala Ser Gly Glu Ala Thr Val Ala Thr Ala Asn Gly Gly
50 55 60
Pro Gln Ser Ala Pro Ala Thr Ser Glu Ala Thr Pro Gln Pro Gln Ala
65 70 75 80
Gln Thr Ala Thr Val Val Ser Ala Ser Thr Thr Ala Ser Pro Ser Ser
85 90 95
Ala Ser Asp Val Lys Ala Pro Gln Ala Ala Ser Thr Thr Ser Ala Ser
100 105 110
Ser Thr Pro Ala Ala Ala Ser Asn Asn Ser Asn Gln Ala Thr Gly Thr
115 120 125
Glu Val Glu Thr Pro Met Met Glu Val Glu Gln Tyr Lys Val Asp Lys
130 135 140
Glu Lys Thr Glu Leu Lys Val Lys Asp Gly Asn Lys Leu Asn Ser Ser
145 150 155 160
Gly Ser Asp Lys Gln Leu Ile Arg Asn Arg Asp Gly Lys Gln Arg Asp
165 170 175
Ile Val Asp Val Thr Arg Thr Val Lys Thr Asn Glu Asp Gly Thr Ile
180 185 190
Asp Val Thr Val Thr Val Lys Pro Lys Gln Ile Asp Glu Gly Ala Asp
195 200 205

Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Ser Glu Asp Asp Phe
210 215 220
Lys Asn Ala Lys Glu Lys Ile Lys Thr Leu Val Thr Thr Leu Thr Gly
225 230 235 240
Lys Ser Ser Asp Gly Lys Glu Asn Leu Asn Asn Arg Asn Thr Val Arg
245 250 255
Leu Met Thr Phe Tyr Arg Lys Ile Ser Glu Pro Ile Asp Leu Ser Gly
260 265 270
Lys Thr Ser Glu Glu Val Glu Lys Glu Leu Asp Asn Ile Trp Asp Lys
275 280 285
Val Lys Lys Glu Asp Trp Asp Trp Gly Val Asp Leu Gln Gly Ala Ile
290 295 300
His Arg Ala Arg Asp Ile Phe Lys Lys Asp Gln Glu Lys Lys Ser Gly
305 310 315 320
Lys Arg Gln His Ile Val Leu Phe Ser Gln Gly Glu Ser Thr Phe Ser
325 330 335
Tyr Asp Ile His Glu Lys Ser Lys Asn Leu Ser Arg Ile Asn Glu Lys
340 345 350
Ile Thr Ser Ser Asn Pro Leu Leu His Trp Pro Pro Ile Phe Asn His
355 360 365
Thr His Gln Asn Ala Asp Met Leu Asn Glu Ile Asn Ser Ile Val Lys
370 375 380
Ile Gly Glu Gln Leu Gly Ile Lys Gly Leu Ser Asn Ile Arg Asp Ile
385 390 395 400

```
Leu Thr Ala Ala Gly Val Gly Ser Gly Leu Leu Gly Ser Val Val Gly
                405                 410                 415
Gly Gly Ser Leu Thr Glu Tyr Leu Thr Leu Lys Glu Tyr Lys Ser Asp
            420                 425                 430
Lys Leu Leu Glu Glu Ser Gln Phe Asp Tyr Thr Gln Thr Cys Gly
        435                 440                 445
```

<210> 52
<211> 247
<212> PRT
<213> Streptococcus pyogenes

<400> 52

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Asn Ala Asn Ala Glu Thr
 1               5                  10                  15
Ser Thr Thr Pro Ala Thr Thr Thr Pro Ser Thr Ser Thr Ile Thr Ser
            20                  25                  30
Gly Thr Ala Ala Ser Val Thr Gly Asn Glu Ala Thr Val Ala Thr Ala
        35                  40                  45
Thr Thr Thr Asn Gly Gly Thr Gln Ser Val Thr Ala Thr Ser Glu Ala
    50                  55                  60
Thr Pro Gln Pro Gln Ala Gln Lys Ala Pro Ala Thr Thr Ser Thr Ser
65                  70                  75                  80
Ser Ala Ser Ser Ser Asn Glu Lys Ser Thr Thr Ala Ala Thr Ser Ser
                85                  90                  95
Thr Pro Ser Thr Ser Ser Ser Ser Glu Ala Asn Ser Asp Ala Lys Ser
            100                 105                 110
Asn Lys Val Ala Ala Thr Pro Pro Ser Ala Thr Val Ala Ser Pro Ser
        115                 120                 125
Asn Gly Ser Asn Gln Gly Thr Ser Ala Glu Thr Ala Pro Gln Met Met
    130                 135                 140
Glu Val Glu Gln Tyr Lys Ile Lys Asp Glu Asn Ser Ser Ile Thr Val
145                 150                 155                 160
Ala Asp Lys Asp Lys Gln Leu Lys Ile Arg Arg Asp Ile Asp Asn Pro
                165                 170                 175
Lys Asp Lys Asp Leu Phe Asp Val Thr Arg Glu Val Lys Asp Asn Gly
            180                 185                 190
Asp Gly Thr Leu Asp Val Thr Leu Lys Val Thr Pro Lys Gln Ile Asp
        195                 200                 205
Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Lys Lys Met Ser
    210                 215                 220
Glu Asp Asp Phe Lys Asn Ala Lys Glu Lys Ile Lys Lys Leu Val Thr
225                 230                 235                 240
Thr Leu Thr Ser Lys Ser Ala
                245
```

<210> 53
<211> 213
<212> PRT
<213> Streptococcus pyogenes

<400> 53

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Ala Thr Gly Ser Thr
 1               5                  10                  15
Glu Thr Ser Ala Ala Ser Thr Ala Ser Pro Gly Thr Thr Ala Asn Gly
            20                  25                  30
```

```
Thr Ala Asp Thr Thr Pro Ser Ala Thr Thr Gly Thr Gly Glu Ala Ala
        35                  40                  45
Gly Ser Gly Thr Ser Ser Gly Thr Thr Val Ala Thr Ala Thr Thr Thr
    50                  55                  60
Asn Gly Gly Thr Gln Ser Thr Pro Ala Ala Ala Glu Thr Thr Pro Gln
65                  70                  75                  80
Pro Gln Ala Gln Thr Ala Thr Val Ala Ser Ala Ser Thr Thr Ala Ser
                85                  90                  95
Ser Ser Ser Ser Asp Gly Lys Ala Pro Gln Ala Ala Ser Thr Thr Ser
            100                 105                 110
Ser Ser Thr Pro Ala Ala Ala Ser Asn Asn Ser Asn Gln Glu Ala Ser
        115                 120                 125
Ala Lys Ala Glu Thr Pro Met Met Asp Val Glu Gln Tyr Lys Val Asp
    130                 135                 140
Lys Glu Glu Thr Glu Leu Lys Val Lys Asp Gly Asp Lys Ser Lys Asn
145                 150                 155                 160
Gly Arg Thr Val Asn Gln Asn Thr Lys Leu Ile Arg Asn Arg Asp Gly
                165                 170                 175
Lys Gln Arg Asp Ile Phe Asp Ile Lys Arg Glu Val Lys Asp Asn Gly
            180                 185                 190
Asp Gly Thr Leu Asp Val Thr Leu Lys Val Thr Pro Lys Gln Ile Asp
        195                 200                 205
Glu Gly Ala Asp Val
    210
```

<210> 54
<211> 430
<212> PRT
<213> Streptococcus pyogenes

<400> 54

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Gly Ala Ser Thr Thr Asn
 1               5                  10                  15
Thr Glu Thr Ser Ala Ser Thr Thr Ser Thr Ala Glu Thr Ser Thr Thr
            20                  25                  30
Thr Gly Thr Ser Gly Thr Ala Ala Ser Glu Thr Gly Ser Gly Thr Ser
        35                  40                  45
Asp Val Ser Val Val Ser Ser Glu Gly Ser Gln Gly Ser Glu Ser Ala
    50                  55                  60
Gln Ala Ser Pro Gln Ala Gln Ala Ala Pro Ala Ala Glu Thr Thr Pro
65                  70                  75                  80
Lys Ala Gln Ala Gln Ala Ala Pro Val Ala Ser Ala Ser Thr Thr Ala
                85                  90                  95
Ser Ser Ala Ser Ser Asn Val Lys Thr Pro Lys Thr Glu Ser Ala Thr
            100                 105                 110
Ile Ser Ser Thr Pro Ala Val Ala Ser Ser Asn Gly Ser Asn Gln Glu
        115                 120                 125
Ala Ser Ala Glu Thr Glu Pro Gln Met Met Asp Val Glu Gln Tyr Lys
    130                 135                 140
Val Asn Lys Glu Lys Thr Glu Leu Thr Val Lys Asp Gly Thr Gln Pro
145                 150                 155                 160
Lys Asn Gly Arg Thr Val Asn Gln Asn Thr Lys Leu Ile Arg Asn Arg
                165                 170                 175
Asp Gly Glu Gln Arg Asp Ile Phe Asp Ile Lys Arg Glu Val Lys Thr
            180                 185                 190
Asn Ala Asp Gly Thr Ile Asp Val Thr Val Thr Val Thr Pro Lys Glu
        195                 200                 205
```

```
Ile Asp Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser Lys Lys
    210                 215                 220
Met Thr Glu Glu Asp Phe Lys Asn Ala Lys Asp Lys Ile Lys Lys Leu
225                 230                 235                 240
Val Thr Thr Leu Thr Gly Asp Lys Arg Glu Ala Ser Phe Thr Arg Asn
                245                 250                 255
Ser Val Arg Leu Met Thr Phe Tyr Arg Glu Ile Ser Asp Pro Ile Asp
            260                 265                 270
Ile Ser Gly Lys Thr Asp Asp Glu Leu Asp Lys Leu Leu Asp Lys Leu
        275                 280                 285
Arg Gln Glu Ala Lys Asp Glu Cys Asp Trp Gly Val Asp Leu Gln Gly
    290                 295                 300
Ala Ile His Lys Ala Arg Glu Val Phe Asn Asn Glu Asn Asn Asn Ser
305                 310                 315                 320
Lys Lys Lys Ser Gly Lys Arg Gln His Ile Val Leu Phe Ser Gln Gly
                325                 330                 335
Glu Ser Thr Phe Ser Tyr Asp Ile Lys Asn Lys Lys Asp Ser Lys Leu
            340                 345                 350
Gln Lys Asn Arg Leu Thr Thr Val Thr Thr Ser Asn Pro Leu Phe Ser
        355                 360                 365
Trp Phe Pro Ile Phe Asp His Thr Asn Arg Lys Ala Asp Met Leu Glu
    370                 375                 380
Asp Phe Asp Lys Leu Leu Ser Ile Ala Gln Lys Phe Gly Ile Glu Ile
385                 390                 395                 400
Pro Lys Glu Val Thr Ala Gly Leu Arg Ala Val Thr Thr Ala Asn Ser
                405                 410                 415
Trp Phe Gly Ser Val Ile Gly Ser Asp Ser Leu Thr Asp Tyr
            420                 425                 430
```

<210> 55
<211> 456
<212> PRT
<213> Streptococcus pyogenes

<400> 55

```
Ile Ala Pro Thr Val Leu Gly Gln Glu Val Ser Ala Thr Gly Ser Thr
 1               5                  10                  15
Glu Thr Ser Ala Ala Ser Thr Ala Ser Pro Gly Thr Thr Ala Asn Gly
            20                  25                  30
Thr Ala Asp Thr Thr Pro Ser Ala Thr Thr Gly Thr Gly Glu Ala Ala
        35                  40                  45
Gly Ser Gly Thr Ser Ser Gly Thr Thr Val Ala Thr Ala Thr Thr Thr
    50                  55                  60
Asn Gly Gly Thr Gln Ser Thr Thr Ala Ser Glu Thr Thr Pro Gln Pro
65                  70                  75                  80
Gln Ala Gln Thr Ala Val Ala Thr Ser Ser Ser Ser Ser Asn Ala Asn
                85                  90                  95
Ala Ser Ser Ser Ser Glu Glu Lys Thr Pro Lys Thr Ala Thr Ser Ser
            100                 105                 110
Thr Ser Ser Thr Ser Ser Thr Pro Ala Ala Ala Ser Asn Asn Ser Asn
        115                 120                 125
Gln Glu Ala Ser Ala Glu Thr Glu Pro Gln Met Met Asp Val Glu Gln
    130                 135                 140
Tyr Lys Val Asp Lys Glu Glu Thr Glu Leu Lys Val Lys Asp Gly Asp
145                 150                 155                 160
Lys Ser Lys Asn Gly Arg Thr Val Asp Gln Asn Thr Lys Leu Ile Arg
                165                 170                 175
```

```
Asn Arg Asp Gly Lys Gln Arg Asp Ile Val Asp Val Thr Arg Thr Val
            180                 185                 190
Lys Thr Asn Glu Asp Gly Thr Ile Asp Val Thr Val Thr Val Lys Pro
        195                 200                 205
Lys Gln Ile Asp Glu Gly Ala Asp Val Met Ala Leu Leu Asp Val Ser
    210                 215                 220
Lys Lys Met Thr Asp Ala Asp Phe Asn Asn Ala Lys Asp Lys Ile Lys
225                 230                 235                 240
Lys Leu Val Thr Thr Leu Thr Ser Lys Ser Pro Asp Gly Gln Gln Asn
                245                 250                 255
Leu Asn Asn Arg Asn Arg Val Arg Leu Met Thr Phe Tyr Arg Glu Ile
            260                 265                 270
Ser Asp Ser Ile Asp Ile Ser Gly Lys Thr Asp Asp Glu Leu Asp Gly
        275                 280                 285
Leu Leu Asn Lys Leu Arg Gln Glu Ala Lys Asp Glu Tyr Asp Trp Gly
    290                 295                 300
Val Asp Leu Gln Gly Ala Ile His Lys Ala Arg Glu Ile Phe Asn Lys
305                 310                 315                 320
Glu Lys Glu Lys Asn Ser Gly Lys Arg Gln His Ile Val Leu Phe Ser
                325                 330                 335
Gln Gly Glu Ser Thr Phe Ser Tyr Asp Ile Gln Lys Ser Glu Lys Glu
            340                 345                 350
Asn Ser Arg Asn Leu Ser Arg Ile Asn Glu Lys Ile Thr Ser Ser Asn
        355                 360                 365
Pro Leu Leu Pro Trp Pro Pro Ile Phe Asn Gln Thr His Gln Asn Ala
    370                 375                 380
Asp Met Leu Lys Asp Val Asp Phe Leu Ile Ser Leu Ala Gln Lys Leu
385                 390                 395                 400
Gly Met Thr Glu Leu Ser Ser Ile Lys Thr Ile Leu Gln Gly Val Gly
                405                 410                 415
Gln Val Ser Gln Phe Gly Gly Phe Leu Leu Gly Gly Gly Ser Leu Thr
            420                 425                 430
Glu Tyr Leu Thr Leu Gln Glu Tyr Lys Thr Asp Thr Phe Thr Lys Glu
        435                 440                 445
Gln Phe Asp Tyr Thr Lys Thr Arg
    450                 455
```

<210> 56
<211> 1091
<212> PRT
<213> Streptococcus dysgalactiae

<400> 56

```
Met Thr Asn Cys Lys Tyr Lys Leu Arg Lys Leu Ser Ile Gly Leu Val
 1               5                  10                  15
Ser Val Gly Thr Met Phe Met Ala Ala Pro Val Met Gly Glu Asp Ala
            20                  25                  30
Ser Gln Pro Thr Ala Ser Val Thr Thr Glu Ser Pro Ala Ile Gln Thr
        35                  40                  45
Glu Glu Asp Gln Gly Ser Gln Ala Glu Ala Leu Glu Glu Pro Thr Pro
    50                  55                  60
Ala Pro Gln Thr Ser Pro Ser Thr Val Ser Ala Val Pro Ala Glu Ala
65                  70                  75                  80
Ala Ala Met Ala Asp Glu Lys Gly Ile Ala Glu Ala Pro Ala His Glu
                85                  90                  95
Pro Ala Pro Lys Ala Ser Val Gln Ala Glu Ala Ala Ser Pro Ala Gly
            100                 105                 110
```

```
Lys Ala Glu Ala Thr Thr Asn Thr Gly Gln Pro Thr Asn Thr Glu Gln
        115                 120                 125
Ala Arg Ser Arg Ser Lys Arg Ala Ala Glu Ile Ala Pro Gln Thr Ile
    130                 135                 140
Glu Val Glu Lys Leu Glu Val Asp Lys Glu Asn Ser Ser Leu Thr Val
145                 150                 155                 160
Lys Asp Gly Glu Lys Asp Lys Gln Leu Ile Lys His Arg Asp Gly Asn
                165                 170                 175
Gln Arg Asp Ile Phe Asp Ile Ser Arg Asp Val Lys Val Asn Gln Asp
            180                 185                 190
Gly Thr Met Asp Val Thr Leu Thr Val Lys Pro Lys Gln Ile Asp Glu
        195                 200                 205
Gly Ala Glu Val Ile Val Leu Leu Asp Thr Ser Gln Lys Met Thr Glu
    210                 215                 220
Thr Asp Phe Asn Thr Ala Lys Glu Asn Ile Lys Lys Leu Val Thr Thr
225                 230                 235                 240
Leu Thr Gly Thr Thr Asp Lys Glu Gly Lys Asn Val Ser His Tyr Asn
                245                 250                 255
Asn Arg Asn Ser Val Arg Leu Ile Asp Phe Tyr Arg Lys Val Gly Glu
            260                 265                 270
Ser Thr Asp Leu Ser Gly Trp Asp Ala Lys Lys Ile Asp Glu Lys Leu
        275                 280                 285
Asn Glu Val Trp Lys Lys Ala Lys Asp Asp Tyr Asn Gly Trp Gly Val
    290                 295                 300
Asp Leu Gln Gly Ala Ile His Lys Ala Arg Glu Ile Phe Asn Leu Asp
305                 310                 315                 320
Lys Glu Lys Arg Ser Gly Lys Arg Gln His Ile Val Leu Phe Ser Gln
                325                 330                 335
Gly Glu Ser Thr Phe Ser Tyr Asp Ile Lys Asp Lys Ser Lys Met Asp
            340                 345                 350
Lys Val Ala Val Glu Glu Pro Val Thr Tyr Ser Asn Pro Leu Phe Pro
        355                 360                 365
Trp Pro Phe Tyr Phe Asp Thr Thr Thr Arg Thr His Asn Val Val Asn
    370                 375                 380
Asp Ala Lys Lys Leu Ile Asp Phe Leu Asn Lys Leu Gly Ile Ser Gln
385                 390                 395                 400
Phe Asn Gly Ala Val Asp Asn Val Ala Thr Val Gly Asn Thr Leu Leu
                405                 410                 415
Gly Leu Gly Ser Phe Phe Gly Leu Lys Asn Pro Leu Asp Tyr Ile Ser
            420                 425                 430
Leu Ala Asp Leu Glu Thr Ser Lys Leu Asn Ser Glu Lys Phe Asp Tyr
        435                 440                 445
Ser Arg Arg Val Gly Glu Gly Tyr Asn Phe Arg Ser Tyr Phe Asp Arg
    450                 455                 460
Glu Val Asp Lys Val Gly Phe Lys Lys Ile Leu Val Glu Lys Ile Lys
465                 470                 475                 480
Gly Asn Leu Lys Lys Phe Gln Pro Lys Gln Thr Asp Thr Trp Leu Ser
                485                 490                 495
Ser Leu Gly Leu Asn Ser Ile Lys Glu Lys Ile Gln Asp Trp Met Ile
            500                 505                 510
Asp Lys Ala Leu Asp Asn Leu Phe Tyr Arg Arg Gln Tyr Gln Phe Tyr
        515                 520                 525
Asn His Asn Leu Ser Ala Gln Ala Glu Ala Arg Met Ala Arg Glu Glu
    530                 535                 540
Gly Ile Lys Phe Tyr Ala Val Asp Val Thr Glu Pro Glu Arg Ile Ala
545                 550                 555                 560
Lys Glu Ile Asn Ser Gln Lys Tyr Ser Glu Ala Tyr Thr Asn His Leu
```

```
                565                 570                 575
Lys Lys Lys Ala Glu Glu Ala Arg Glu Leu Ala Lys Lys Arg Asn Glu
            580                 585                 590
Lys Phe Asp Lys Tyr Leu Lys Glu Met Ser Glu Ser Gln Lys Phe Phe
        595                 600                 605
Lys Asp Val Glu Asp Pro Glu Lys Phe Lys Asp Ile Leu Thr Glu Leu
    610                 615                 620
Lys Val Thr Glu Thr Phe Glu Glu Lys Val Ser Val Asn Asn Ser Glu
625                 630                 635                 640
Gln Arg Lys Ser Asn Lys Glu Val Glu Tyr Lys Lys Ala Ser Ser Asn
                645                 650                 655
Ser Ser Phe Leu Ser Phe Ile Phe Ser Ser Ser Thr Asn Glu Ser Ile
            660                 665                 670
Thr Trp Thr Leu Ser Lys Asp Lys Leu Gln Lys Ala Leu Gln Ser Gly
        675                 680                 685
Glu Thr Leu Thr Leu Glu Tyr Lys Leu Lys Ile His Lys Asp Lys Phe
    690                 695                 700
Lys Leu Ala Pro Gln Thr Arg Ser Lys Arg Ser Leu Asp Thr Ser Glu
705                 710                 715                 720
Asn Lys Lys Ser Val Thr Glu Lys Val Ile Thr Ser Asp Val Lys Tyr
                725                 730                 735
Lys Ile Asn Asp Lys Glu Val Lys Gly Lys Glu Leu Asp Asp Val Ser
            740                 745                 750
Leu Thr Tyr Ser Lys Glu Thr Val Arg Lys Pro Gln Val Glu Pro Asn
        755                 760                 765
Val Pro Asp Thr Pro Gln Glu Lys Pro Leu Thr Pro Leu Ala Pro Ser
    770                 775                 780
Glu Pro Ser Gln Pro Ser Ile Pro Glu Thr Pro Leu Ile Pro Ser Glu
785                 790                 795                 800
Pro Ser Val Pro Glu Thr Ser Thr Pro Glu Gly Pro Thr Glu Gly Glu
                805                 810                 815
Asn Asn Leu Gly Gly Gln Ser Glu Glu Ile Thr Ile Thr Glu Asp Ser
            820                 825                 830
Gln Ser Gly Met Ser Gly Gln Asn Pro Gly Ser Gly Asn Glu Thr Val
        835                 840                 845
Val Glu Asp Thr Gln Thr Ser Gln Glu Asp Ile Val Leu Gly Gly Pro
    850                 855                 860
Gly Gln Val Ile Asp Phe Thr Glu Asp Ser Gln Pro Gly Met Ser Gly
865                 870                 875                 880
Asn Asn Ser His Thr Ile Thr Glu Asp Ser Lys Pro Ser Gln Glu Asp
                885                 890                 895
Glu Val Ile Ile Gly Gly Gln Gly Gln Val Ile Asp Phe Thr Glu Asp
            900                 905                 910
Thr Gln Ser Gly Met Ser Gly Asp Asn Ser His Thr Asp Gly Thr Val
        915                 920                 925
Leu Glu Glu Asp Ser Lys Pro Ser Gln Glu Asp Glu Val Ile Ile Gly
    930                 935                 940
Gly Gln Gly Gln Val Ile Asp Phe Thr Glu Asp Thr Gln Thr Gly Met
945                 950                 955                 960
Ser Gly Ala Gly Gln Val Glu Ser Pro Thr Ile Thr Glu Glu Thr His
                965                 970                 975
Lys Pro Glu Ile Ile Met Gly Gly Gln Ser Asp Pro Ile Asp Met Val
            980                 985                 990
Glu Asp Thr Leu Pro Gly Met Ser Gly Ser Asn Glu Ala Thr Val Val
        995                 1000                1005
Glu Glu Asp Thr Arg Pro Lys Leu Gln Phe His Phe Asp Asn Glu Glu
    1010                1015                1020
```

```
Pro Val Pro Ala Thr Val Pro Thr Val Ser Gln Thr Pro Ile Ala Gln
1025                1030                1035                1040
Val Glu Ser Lys Val Pro His Ala Lys Ala Glu Ser Ala Leu Pro Gln
                1045                1050                1055
Thr Gly Asp Thr Asn Lys Leu Glu Thr Phe Phe Thr Ile Thr Ala Leu
            1060                1065                1070
Thr Val Ile Gly Ala Ala Gly Leu Leu Gly Lys Lys Arg Arg Asn Asn
        1075                1080                1085
Gln Thr Asp
    1090
```

<210> 57
<211> 3276
<212> DNA
<213> Streptococcus dysgalactiae

<400> 57

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acggaatccc cagcgataca aactgaagag gatcaaggta gccaagctga ggcgctagaa     180
gaaccgacac cagctcctca aactagtcct tctacagtaa gcgctgtgcc agctgaagca     240
gctgccatgg ctgatgagaa agggattgct gaagccccag cccacgagcc agctccaaaa     300
gcttctgttc aagcggaagc ggctagcccc gctggtaaag ctgaagctac tactaacact     360
ggtcaaccga ccaacacaga gcaagcacgt tcccgcagca agcgtgccgc agagatagca     420
cctcaaacca tagaagtgga aaaacttgag gttgataaag aaaactccag ccttactgtt     480
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tttgatatca gtcgagatgt gaaagtcaat caagatggaa caatggatgt taccctaaca     600
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aaaatgactg aaaccgattt taatacggca aaagaaaaca tcaaaaaatt agtgacaaca     720
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